JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. LXXX., No. 2058.—TUESDAY, OCTOBER 21, 1902.

EDITORIAL NOTES.

The Statutory Situation.

THE abstracts of the Gas Acts of the year which is now appearing in the "JOURNAL" will, we doubt not, be scanned with more than the ordinary degree of interest by all who are responsible for the administration of gas undertakings in the United Kingdom. There are few matters of so great importance to the industry to be found at any time in our columns, and none of greater weight. It is generally understood that the gas industry of the country is actually passing through a crisis in its fortunes, the like of which is not to be found in its history. This phase of the statutory gas industry of the United Kingdom—which, because it is the subject of parliamentary regulation, is unlike any other gas supply in the world—has been led up to by a momentous series of causes, small and large, dating from the closing years of the past century. It is notoriously difficult to appreciate at the time the real importance and significance of contemporary events and the signs of the period. There are no such things as trifles in human observation and experience. Similarly, the things we make most fuss over at the time are often forgotten in a year or two. The fact which our current abstract of the Gas Acts has moved us to dwell upon is the many indications these offer of the infusion of a new spirit into the gas industry, dating from the last three or four years. Almost insensibly, so gradual has been the process, the character of the gas industry, as reflected by Parliament, has changed. The days of the old familiar Gas Acts or Provisional Orders, which only differed from one another in name and in the amount of capital and the price of gas, have passed away. Some of these stereotyped enactments remain in evidence, of course, because the new stirring of an old industry is not equally felt at the same time and in like degree everywhere; but they are becoming the minority instead of being the rule.

It is so difficult as to be virtually impossible for any, even the most alert and practised, observer to detect and measure the new developments actually going on under his eyes in such a national interest and industry as that of gas supply. Not even those who are identified with these innovations and alterations know precisely what they are doing. The phrase about those who "build better than they know" indicates what is really one of the hidden ways of the human spirit. If development is something more than growth, if evolution is the law of expanding life, then it follows that their early signs and workings must be inchoate, formless, and to some extent unrecognizable for what they truly are. It is only at a later stage that the real character, and perhaps the potentialities, of these excrescences upon the old stock are apparent. Just so it has become possible to see in contemporary gas legislation some correspondences with the beginnings of a new order. These are vague, and mostly small; but that is only what, under the conditions, one would expect. The great thing is they are there at all.

It would not be doing our readers any service to pick out from our abstract this or that point, or so many lines, which bear out this general assertion. There are too many antagonistic powers, ready and willing to strangle the infant Hercules in his cradle, to permit of this exercise. Suffice it to state for the present purpose that the abstract has been made with most scrupulous care, and that not a word of it is insignificant. The King's Printers are so long in getting out the ordinary prints of the Acts—there are so many of these, of course, of all sorts—that the "JOURNAL" must be for the nonce the sole available source of information upon this head. Several of the enactments of the year constitute precedents; and it must be some years before the general level of gas companies' powers can be brought up to the mark of the more advanced of these measures. Speaking generally, it can be truly said that this Parliament, like its immediate precursor, has dealt very fairly with gas companies who could show a respectable case for amended or extended powers. There is something, as followers of parliamentary doings know, in the fashion or the feeling of the Legislature for the time being. At the period of the passing of the first Electricity Act, for example, municipalities were in the ascendant. Gas companies were, perhaps naturally, rather under a cloud. For the past two or three years, a totally different feeling has prevailed at Westminster. The House of Commons, as has been said in more than one quarter, has revolted against the oligarchy of the Town Clerks. Legislators, even those elected upon "popular" grounds, have resented the obvious desire of the party represented in the House by Sir Albert Rollit to set up an "*imperium in imperio*" to the disadvantage of private initiative; and they have made this feeling respected in many instances. The result has been that anything that could be honestly commended as showing initiative has prevailed against the powers of parochial officialism. "Power-in-bulk" schemes, electric and gas, although open to the reproach of being rather visionary, were not thrown out on the opposition of municipal officialdom. Such arbitrary and reactionary opposition as even the London County Council mustered to gas companies showing cause why they should have freer hands, failed to command the respect of Parliament. All this is worthy of note, though it needs wary application to particular instances.

It is not to be thought that any and every thing a gas company might propose will go through both Houses; but it can be relied upon that the present Parliament will continue to treat Private Bill Legislation upon its merits, which is all that need be asked for. There is practically no risk of a meritorious proposal on the part of private enterprise suffering from undue respect being paid in the House of Commons to such abstractions as "Municipalism," "democratic ideals," or any other platform phrase. Nor is there the remotest prospect that Parliament will give up any of its powers for "seeing fair" between the parties to statutory undertakings. Politicians out of office may talk about the desirability of some large measure of "devolution;" but it will go no farther. Parliament can well do its duty to the nation in the Committee-rooms, even though its cherished windbags in the House continue to waste public time after their manner. Most certainly, the modern tendency of local authorities to go into trade on their own account has effectually stopped all thought of entrusting larger powers to county or provincial bodies. This is something to be thankful for. On a dispassionate review of the statutory situation, therefore, we cannot find in it anything the reverse of encouraging to well-reputed, enterprising gas companies desirous of keeping abreast of the times.

The Halifax Imbroglio.

THE more there is published concerning the affairs of the Halifax Corporation Gas Department, the more confused and perplexing does the position of things appear, and the more convinced are we that this is a case in which the Gas Committee should without delay submit both the administrative and the engineering procedure of the last few years to independent expert investigation. The one cannot be separated from the other, as what has been done must have been authorized and endorsed by the Committee themselves. The folly of continuing an inquiry by a body of men uneducated (excepting a unit) in gas matters is fully attested by the admission of the Sub-Committee which we published on Sept. 23, that, owing to the "general chaos," they had "only practically touched the fringe of the work they were "authorized to look into and report upon." This confession, after seven months' work, is the most eloquent voucher that they could have given of their incompetency to deal with the matter. If the Gas Committee have not the courage to propose an independent inquiry into the Department's doings and work, then the best thing that can happen—in the interests of the ratepayers, the prestige of the Corporation, and the defence of municipal trading as practised at Halifax—will be for the Corporation to insist that such a course be taken.

The origin of the present trouble was the loss of £13,000 on last year's trading, compared with a profit before the coal difficulty of £18,500. But, in the two years ending

March 31, 1900, the cost of coal was £64,176, in the next two years it was £96,863—an increase of £32,687. This expense notwithstanding, one of the questions Halifax people want to have answered is why it is their trading during the period of stress should bear so unfavourable a comparison with other gas undertakings in the country. The reply the Gas Committee have not yet given, nor have they supplied information from which conclusions can be drawn. However, inseparable from a consideration of this loss is the position of the capital of the undertaking; and on this head the statement by the Borough Accountant (Mr. J. Nicholl), published elsewhere in this issue, supplies some startling information. It discloses an enormous expenditure of capital on the works during the past four years. Nevertheless, we find that this largely increased capital expenditure was not, in one respect, a cause contributing to last year's (from the ratepayers' point of view) disastrous results. The explanation of this curious fact is that, at the time the Corporation Act of 1898 was passed, the annual contribution to the sinking fund on the gas-works account had grown until it had reached 2 per cent. on the total capital expenditure. But, by the Act, the period of repayment for the balance of the debt was extended, and the annual payment reduced to 0·82 per cent. Thus while, in 1896, the cost of gas was charged with a contribution to the sinking fund which amounted to £4532, last year it had fallen to £3245, notwithstanding the large amount of additional capital. The significance of this is better seen in the Borough Accountant's report, which states that there was a saving last year, through the operation of the Act of 1898, of £6069 on gas-works account—in other words, if the conditions had remained the same as before 1898, there would, in respect of sinking fund, have been a further charge to gas-works account in 1901-2 to the extent of £6069. This is a proof of the enormous rate at which capital expenditure has been growing, and also a revelation as to what would have been the result of last year's working if the conditions existing prior to 1898 had still ruled. Instead of a loss of £13,000, the adverse balance would, if we interpret the meaning of the figures correctly, have stood at something above £19,000. But while the contribution to the sinking fund has been greatly reduced, the interest on the enormously enlarged capital must have taken the opposite course. Besides this, the far-seeing economist cannot ignore the fact that the longer the repayment of capital is delayed, the greater must be the ultimate amount of interest that the ratepayers will be called upon to pay. Therefore, when we come to take into consideration the profit made before the coal difficulty, the loss last year, and the "saving" on sinking fund, it is apparent that there are other things to be sought for beyond the enhanced price of coal and oil to account for the financial state of the Halifax Gas Department. To fathom these things, another order of capacity from that possessed by the Gas Committee is needed.

The inquiry as to the loss on last year's trading must, of course, take into consideration whether the large capital expenditure referred to has shown, or ever will show, its impression from the point of view of economy, and in a measure commensurate with the capital cost. Even economy in working expenses can be purchased at various prices, and sometimes too dearly; and the people of Halifax should demand to know from their representatives whether, in the opinion of a disinterested and qualified judge of these matters, the economy effected in working—if such there be, or will be—has been acquired at a fair cost or otherwise, having regard also to the character of the work. Unaided, they will not be much informed or relieved by the Borough Accountant's statement regarding the gas-works capital expenditure since 1898; for this tells them, as plainly as anything can, that while it was estimated, in connection with the Act of 1898, that the works required in the succeeding ten years would cost £150,000, although half that time has not expired the actual outlay on the works since carried out has amounted to £225,484—and this notwithstanding that a gasholder estimated to cost in 1898 £50,000 has not been constructed. In other words, the difference is between £100,000 and the £225,484. This is a serious variation from the original estimate; and it must, to obtain satisfaction, be tested by a detailed examination.

The questions which an expert would answer, and which the Gas Committee cannot answer, are whether the whole of this expenditure was necessary for immediate and probable prospective demand, and whether the works represented by the expenditure have been executed in the cheapest way consistent with good service. The tenders for the works set against the actual cost do not suggest that in all cases they have been; but it must not be overlooked that there may be explanations of which the Borough Accountant's statement, being purely financial, takes no notice. Therefore it would not be just on this bare exposure of the capital outlay to criticize or judge. Take, for instance, two of the worst examples of differences between the amounts of tenders and actual cost—the new retort-house and the inclined retorts and fittings. The tenders for the house amounted to £9041, and the actual cost was £18,621. The inclined retorts and fittings were tendered for at £6350, while the actual outlay has been £26,187. How has this come about? It may be due to departures from and enlargements of the original design; and it may also be partly due to the fact that the work was carried out by administration and not by contract. If any substantial amount of the difference is attributable to this latter fact, then, as an example, it supplies an additional strong brace for the arguments against municipal work. Unless Mr. Holgate can show retort-house plant equivalent to the higher cost, then it will be idle for him to continue to make it a point of defence or for congratulation that a minimum of the money spent has gone into the pockets of middlemen and contractors. The money has passed out of the pockets of the Council and the ratepayers; and the latter want to know what they have received for it. Neither the Gas Committee nor the Council are in the position to tell them whether they possess adequate value; and therefore it is to be hoped that someone will be promptly appointed who can give the information. Until this is done, there will be dissatisfaction in Halifax.

End of the American Coal Strike.

To the infinite relief and joy of the American people, and the less intense, but very real, satisfaction of the public in this country, the "strenuous" and able President of the United States has affected a settlement of the strike of anthracite miners which, if much longer protracted, would have been the cause of enormous inconvenience and no little suffering to our cousins across the water. Despite the efforts of Mr. Mitchell (the evil genius of the men), and of the papers which support political Trade Unionism, to disguise the fact, the upshot of this long and costly struggle is the absolute defeat of the Union of Mine Workers upon the vital point at issue—namely, the demand that the coalowners, or "operators," as they are called, should "recognize" and negotiate with the Union. The strike came to an end in this wise: Acting upon the advice of the great Mr. Morgan, the operators, seeing the risk they were running of exasperating the public into taking drastic measures for the regulation of trusts, agreed that, if Mr. Roosevelt would appoint a Commission of long-headed men unconnected with either party to the struggle, they would be bound by the findings of that Commission upon all questions at issue between them and their employees, whether Unionist or non-Unionist, on condition that the men at once resumed work and ceased interference with non-Unionists. The operators at the same time issued a statement to the effect that they had never been unwilling to submit their differences with the workmen to a fair tribunal, but that they were unwilling to arbitrate with the Mine Workers' Union, or to enter into an arrangement which would not secure those now working, or wishful to work, the right to do so in safety, whether Unionist or non-Unionist.

Mr. Mitchell (who, be it noted, is not an anthracite miner, but the boss of the Mine Workers' Union, which, originally formed in the bituminous coalfields, took upon itself the "organization," or stirring up to disaffection, of the anthracite miners) was then called upon by Mr. Roosevelt to accept these terms and also to send the men back to work. After hesitating and demurring sufficiently to show how distasteful the pill of "no recognition" of the Union was to him, Mr. Mitchell yielded to the undoubtedly severe pressure the President brought to bear upon him, and agreed to advise the men to resume work on the terms offered. This, there appears no reason to doubt, they will do as soon as possible, though the natural and proper determination of the masters not to discharge the hands they have taken on in place of the strikers may cause temporary trouble.

The remarkably successful intervention of Mr. Roosevelt (who is one of the most striking personalities that have ever

occupied the White House, and that is saying much) differs widely, as "The Times" remarks, from the amiable efforts of more or less distinguished persons in this country who occasionally play the *deus ex machinâ* by carefully watching for the moment when a settlement is inevitable, and then coming forward to split the difference; and his action has attracted much attention here, as well as in America. He has persuaded the coalowners to accept in advance, and agree to be bound for three years by, the findings of a Commission appointed by himself as the head of the Executive Government of the country, and has, therefore, by implication, undertaken to see that those findings are duly respected by both parties, though it was obviously impossible to engage beforehand their acceptance by the men. To realize fully the unusual and novel character of this intervention, it is only necessary to imagine similar action being taken in this country by the King, in the event of a great strike threatening grave suffering to the mass of the people.

As we have just said, the President's action has attracted much notice here; and it has, we may add, been strangely misinterpreted in some quarters. It has led the sedate "Spectator" into a long argument in support of "The Right "of Striking," which it considers to be assailed, all because it imagines Mr. Roosevelt has plainly shown that he "thinks "that a strike which gravely threatens the community may "rightfully be put down," and that such putting down involves forcing the strikers to resume work "under fear "of painful punishment to be inflicted by the State." We should not have thought anyone could imagine that so eminently sensible a man as Mr. Roosevelt would be foolish enough to contemplate compelling or attempting to compel any striker to resume work. What the President evidently contemplated was what would end the majority of strikes, and would certainly have ended one only voted for (as was the American miners' strike) by 461 delegates against 349 voting in favour of remaining at work—namely, the affording by the State of ample protection for men willing to do the work required at the wages offered, against the violence of the men on strike. This is a vastly different matter from compelling the latter to resume work. The "Spectator" says: "Refusal to work is not a crime. . . . The man "who refuses must, of course, take the consequences of his "refusal, which may even be starvation." Quite so; but that is not the Trade Unionists' view of the matter. Their idea is that they are free to refuse to work for an employer, and then free to prevent any other men from doing the work they will not do. That is not "taking the consequences of "their refusal;" it is trying to have it both ways. This is clearly stated by the writer in the second half of the article in question; but he, curiously enough, does not see that it completely explains President Roosevelt's action.

Other journals that ought to know better have been exercising themselves in connection with the refusal of the coalowners to "recognize" the Miners' Union; and we find the "Saturday Review" trotting out the favourite argument of the theoretical Sociologist: "The men have their interests "as well as the employers, and . . . it is mere per- "verseness for employers to refuse to acknowledge the "official organ by which they may be represented. . . . "Experience has shown that where employers are willing "to do justice to their workpeople, they are aided and not "hindered by the existence of a body of responsible men "representing the trade." Before journalists sit down to call some of the most eminent and just employers of labour in this country and in the States "merely perverse," and to tell them what "experience has shown," it would be better if they would make themselves directly acquainted with the actual experience of employers of labour, instead of judging by statements made in public by employers having political axes to grind. Let them (say) ask Sir George Livesey whether he was aided and not hindered by the Gas Workers' Union in his efforts to do justice to his workpeople.

It seems to be almost impossible to get the rights of this "recognition" question into the minds of the public or of those by whom it should be instructed. But we must, when the question is being again so generally discussed, in regard to Lord Penrhyn's action as well as that of the American mine owners, once more point out that the great objections to the recognition by an employer of a Trade Union as the party with whom he is to discuss all matters regarding rates of pay and conditions of employment in his mines or workshops are, that, in practice, as contrasted with theory, the Union officials think most of their own importance, and work to serve their own ends instead of the real interests of the men; and that a "recognized" Union, with its elaborate rules for the workshop, the breach of any of which, even for the purpose of forwarding the interests of the business, is at once severely punished, soon comes to stand between the men and their employer. Shortly, men cannot serve two masters; and a "recognized" Union is often much more than a master—it is a tyrant. That is why we rejoice that Mr. Mitchell has been obliged to stand away from between the miner and his master in Pennsylvania.

The Prime Minister and the Manchester School of Technology.

THE Prime Minister opened last Wednesday the splendid School of Technology which Manchester has provided to rebut the reproach that English manufacturers have no care for the scientific training of the rising generation. There never was any more than part of the truth in the familiar allegation that English people, as a rule, do not believe in education so much as some others; and the truth was that our people, with their rich endowment of common sense and mother wit, failed to see any good in the kind of education which spoilt more young people than it assisted. Now, there ought not to be anything wrong with this new Manchester institution. If it were amiss, one might almost despair of the future of the race. But we will not suspect anything of the kind, and only mention the possibility to dismiss it without a second thought. The consumers of Manchester gas have done their fair share in providing the capital of £300,000 represented by this new municipal asset, which we venture to hope may be classed as the most truly remunerative of all the Corporation undertakings. If only one first-class mechanical genius in every ten years can point to this school as the place where the fetters of ignorance were struck from his native powers, and the wine of encouragement poured into his thirsting soul—nerving his energies for higher tasks—then the investment will be repaid over and over again. We are not going here into the details of the establishment, but cannot refrain from noting with satisfaction that the principle upon which its founders seem to have proceeded is that of educating their students in, not out of, their position and calling.

In the suggestive speech of the Prime Minister, there occurs a passage which we flatter ourselves must have sounded strangely familiar to regular readers of these columns. Mr. Balfour was speaking to the point that "the "persons who are responsible for the manufactures of the "country are the manufacturers"—a broad general truth which will bear a good deal of thinking over. Some people seem to believe it is the Government, or the Local Authority, or the Social Democratic Federation who are responsible for this division of the country's work; but the Premier rightly puts it upon the employers—the masters. They must be the best judges of the kind of assistants they need to help them in the conduct of their affairs; and Mr. Balfour hopes that the exercise of this judgment will prove an endorsement of what the founders and managers of the new school mean it to accomplish. "It is perfectly vain and "useless to turn out highly-trained and capable servants, if "there are not to be employers for them when they are "turned out." True; but it will be equally necessary for the turning-out process to be co-ordinated with the needs enlightened employers experience and are prepared to pay for having supplied. The argument is double-edged.

Speaking of the hackneyed German example, which is so often thrown by professors at the heads of manufacturers, Mr. Balfour went on to remark that it might be overdone. He declared he was quite sure there must be something wrong when the practice of German employers is so enormously different from that of English firms; and he did not, like the professors, jump to the conclusion that the German arrangement must necessarily be the only right one, and the English system utterly wrong. This is pretty much what we have said all along—that the multitude of doctors in German industrial establishments is not necessarily good for all concerned, especially the doctors. Really and truly, there is no particular advantage to be derived from setting University men to drive cabs. Doubtless in England the practice has tended to the opposite extreme, and the so-called "practical man" has often been exalted above his more learned rival. There are, as Mr. Balfour

admitted, dangers on both sides; and the one important rule of efficiency is to keep to the root of the matter, and avoid falling into either stupidity or pedantry.

Sources of Commercial Nitrogen.

THE circumstance of sulphate of ammonia again selling fairly well may predispose gas managers to regard with equanimity the stories told about the prospective fixation on a commercial scale of atmospheric nitrogen, and the further exploitation of the world's nitrate deposits. Both legends are of American origin; and they contradict one another. The argument on one side is that in the rainless regions of the earth, especially on the Western slopes of the great mountain chain of the American Continents, there are such immense deposits of nitrate, suitable for manure, that the world's agriculturists need not look to any other source for the fertilization of their wheat lands. It is declared that these stores of nitrogen will continue to be one of the chief sources of the world's supply for an indefinite time. It is a curious question how these regions became rainless; because they cannot have been always so, or the original materials that have undergone nitrification would not have accumulated there. This nitrifying process has not gone on in the "waste Soudan" for instance—unfortunately for the British Empire—through the absence of the necessary material. There are nitrates in Chili, on the other hand; because the rainfall is now, and has long been, insufficient to carry off in solution the salt as formed in the laboratory of the earth. There is so much of it that Mr. H. W. Wiley, Chief Chemist to the United States Department of Agriculture, opines that there need be no fear of the starvation of the human race, or of its recourse to chemical foods. Natural nitrates are to restore the exhausted wheat lands, and scientific crop rotation is to maintain them in perpetual fertility.

On the other hand, an Atmospheric Products Company has been formed for the commercial production of atmospheric oxides of nitrogen. The method consists in passing large quantities of air through a confined space in which powerful electric arcs are maintained. It has long been known that nitric acid is a product of the electric arc; and, as everybody remembers, Sir William Crookes once discussed, in a British Association address, this means of obtaining nitrogenous manure. An American electrician, Mr. C. S. Bradley, actually does it in a machine which consists of a cylinder having a number of potential arc points projecting into its interior, where a concentric cylinder revolves, and carries a corresponding set of arc points past these—the effect being to make and break a large number of arcs. As air is driven through the machine at the rate of 5 cubic feet per arc per hour, and as the machine can form 400,000 arcs per hour, its capacity in nitrifying should be considerable. It is stated that the effluent air is charged with about 2½ per cent. of oxides of nitrogen, which can be washed down and fixed with potash or soda in the ordinary way. The Niagara Falls are to make nitrate of soda in this way at a cost of about £3 per ton, when the process is fully developed! Meanwhile, makers and users of sulphate of ammonia plant need not retire. The business is doing very fairly well at present, and will probably last our time.

An Ironmonger's Views of Municipal Trading.

A VERY good discourse on municipal trading was recently given by Mr. Theedham before the Sheffield Ironmongers' Association. It is exceedingly useful to hear what typical tradesmen have to say about such a subject as this, which is so much talked over by local politicians and newspaper reporters of no commercial standing. It really does not greatly matter what the retired colonel on the District Council, or the Town Clerk, or the gentleman who does the notes on the Council meetings for the local paper, thinks about the "principle" of municipal trading; but the views of the painter and glazier are worth having. He knows what he is talking about, and feels in his pocket the truth of his opinions. So Mr. Theedham to the Sheffield ironmongers. He was forcible, and also eminently reasonable. Municipal trading, said the author of the paper, is in fashion. It looks rather nice, and lends itself to romance, and pretty tales about profits in aid of rates, which tickle the electors, although the end thereof may be obscure. Mr. Theedham objected to corporations owning gas undertakings going into interior fitting work. He did not object to gas companies doing the same thing, because they are only playing with their own money. It is not often that an ironmonger can distinguish so well between company and corporation trading. Mr. Theedham declared he could see no Free Trade principles in municipal trading. He said he would like to hear Cobden, Bright, Peel, or Gladstone on this side of the question. Is it not somewhat remarkable that the fashion of municipal trading is so novel that it escaped these authorities?

Here is the *crux* of the question, as Mr. Theedham sees it: Municipal trading tends to cut off, one after another, various branches of business by which citizens earn their living. It enormously increases municipal debt, and so lowers the value of property. It allows the ratepayers' money to be used in competition with the ratepayer. Municipal trading cannot be shown to be more efficient than private enterprise, or more economical. It tempts to the exercise of corrupt influences in municipal affairs, which is something to be kept at as great a distance as possible. Mr. Theedham is reserved on the latter point; but it is of capital importance. Indeed, it would not be at all surprising if within a very few years this aspect of municipal trading were in many localities to eclipse all the others. The tendency everywhere is for local government to fall more and more under the domination of small men; and though these men may be actually as upright as the richest in the community, there is no guarantee that their order will always be superior to temptation. The larger the financial concerns of local authorities, the more need there is that the administration should be in responsible hands; yet the ordinary course of municipal affairs points in the contrary direction. This is one—and, indeed, the principal—consideration which makes the judicious shake their heads at the prospect of the unlimited extension of municipal trading. Mention is made elsewhere of the revived project of the Bradford Corporation for establishing a municipal coal supply. This is hailed with a yell of delight by the journalists who make it their business to applaud everything done in the name of a municipality as good, and to denounce all private enterprise as iniquitous. This attitude is rather ill-judged; for suppose local authorities took to starting papers of their own. Why not? There are such things as Government gazettes, and official reports of foreign municipal doings and sayings. A "Manchester Municipal News" would be quite a natural product of the Corporation; but the advertisement branches of other periodicals would suffer, even while the editorial department might, for the sake of consistency, be lauding the enterprise.

Price Cutting in the Gas-Burner Trade.

The issue by Messrs. George Bray and Co., of Leeds, of their "Trade Price Blue Book" for the present month—a neatly printed little pamphlet illustrating the various burners made by the firm—has afforded them an opportunity of making a determined attempt to put a stop to an objectionable and unbusinesslike practice. It appears that complaints have reached them in regard to the "cutting" of the prices of their burners, and they have therefore decided that, in the interests of their wholesale customers, no lower figure shall be charged to the trade than the minimum shown in the little book already mentioned. Messrs. Bray and Co. have not confined their efforts to put a stop to the practice complained of to the simple announcement to which reference has been made, but have gone a step farther, and have decided to cease to do business with any firm failing to comply with their rule. One would have hardly thought there was any room for "cutting" in connection with these goods; but it is to be hoped that the warning now given will be sufficient for those for whom it is specially intended.

Ignorance in the Financial Press.

It sadly shakes one's confidence in the wisdom of writers in the Financial Press to read an article such as appeared in the "Financier" a few days since, under the title of "The Gas Companies." The article, occupying a little short of a column, can only be described as a piece of balderdash, composed of a minimum of fact and a maximum of ignorance. The truth of the matter is, the writer has judged the gas industry on the accounts of the London Gas Companies for a single half year—neither looking to the past nor possessing sufficient acumen to judge of

the future by reading the signs of the present; and altogether he betrays a very superficial knowledge of the gas business, taken as a whole. Among other points, he discusses the effect of the competition of the electric light on gas consumption, and admits that there "seems" to be no falling off in the demand for gas. Nevertheless, he asks, Is this going to last? After a little struggle to find an answer, he arrives at the brilliant conclusion that "it is still an open question whether the consumption is not on the wane." But in the search for a reply, he advances another question, which is a good indicator of the object this writer for the edification (?) of the financial world had in penning this piece of thin verbiage. "Will not," he asks, "electric light more and more supersede gas for all lighting purposes?" The way he puts these direct inquiries, and then evades everything in the nature of a straight reply or definite expression of opinion, is ludicrous in the extreme. If he would only study the literature devoted to both methods of illumination for the past twelve months, it is certain his present hazy notions would be penetrated by a considerable amount of light, which might incline him, if he again deals with the subject, to repeat the last-quoted inquiry with the position of the illuminants reversed. But, on the point as to whether or not gas consumption is on the wane, the writer's doubt appears to have been aroused by the fact that the Gaslight and Coke Company had a decrease of ¾ per cent. in their consumption last half year; and yet later on he mentions that the South Metropolitan Company had an increase of 4½ per cent. Here is the root of the mistake he has made. The Gaslight and Coke Company, large as it is, is not the gas industry, nor is the South Metropolitan Company. But he is apparently not aware of the fact that the experience of the latter is more representative of what is taking place throughout the country in the matter of gas supply than is that of the former. The foregoing is merely typical of the errors with which the article abounds. Had the writer's range of view been more extended, and his knowledge of gas affairs generally a little deeper, he would not have been guilty of the miserable stuff which formed the "leader" in an issue of the "Financier," and probably the misleader of some of its readers. If this may be taken as a sample of expert writing in the Financial Press, then the less guidance taken from it the better will it be for the public.

Is the Percentage of Carbonic Oxide a Measure of the Toxicity of Illuminating Gas?

Frau Ferchland and Herr E. Vahlen, in a recent number of the "Archiv für experimentale Pathologie und Pharmakologie," state that they have found that coal gas, even in considerably smaller quantity than that corresponding to the proportion of carbonic oxide present, has a fatal effect on dogs. For frogs, which are proportionately only slightly susceptible to carbonic oxide poisoning, coal gas is, they say, in general a stronger poison than carbonic oxide. The prevailing opinion that the toxicity of coal gas depends solely on its percentage of carbonic oxide does not, they state, appear to hold good with these animals. The results of these researches lead to a serious doubt whether, under any conditions, the amount of carbonic oxide in coal gas or other illuminating gas is in any degree a measure of its toxicity. And if it is not, it becomes pertinent to ask with regard to the analytical results on London gas recently published by the Chemist to the London County Council, *cui bono?* Can he show that increase in the percentage of carbonic oxide in the gas has been attended by an increased number of fatalities from the accidental inhalation of gas in London? If not, his labours tend to prove that the conclusions of the German experimentalists named above may be extended to human beings, and not limited to the canine and ranine races. But the Home Office may not thank him for furnishing such good evidence of the futility of the recommendations of its Departmental Committee with regard to the supply of carburetted water gas.

Municipal Coals.

The idea of starting in business as coal merchants is by no means a new one to the Bradford City Council. It has been talked about for a long time, and at last the idea has taken definite shape. The Corporation contemplate bringing forward a Bill to complete the Greater Bradford extension scheme; and it has been decided to include in the measure clauses giving power to the city to conduct a municipal coal supply. The scheme appears to be less ambitious than one which was a couple of years ago suggested at Bradford, among other places—namely, to purchase mines, so as to obtain a coal supply for their various undertakings. But still it forms a serious enough encroachment on private business. It is not clear whether the coal is to be supplied at cost price, at a profit, or at a loss; but whatever is done, the result can hardly be otherwise than prejudicial to the coal dealers in the city. Of course, it will be said that the merchants have brought this on themselves, and perhaps this may to an extent be true. Consumers—and especially the very poor—have of late suffered so considerably from the abnormally high prices which they have had to pay for coals, that they are likely to welcome cordially any proposal which seems to offer a prospect of relief. They cannot be expected to consider too closely the principles involved in this extension of the scope of municipal work, or the danger that will in time threaten every branch of commerce, and private business of all kinds, if the passion for trading on the part of local governing bodies is not checked. The figures adduced in support of the Bradford proposal are indeed tempting; it having been stated that some of the coal purchased for the gas-works at an average price of 11s. per ton was suitable for household purposes. One member (who is in the coal trade) remarked that the Corporation could not deliver coals to the householders at anything like the price they were paying for them; but it must be admitted that there is, to say the least, a considerable margin to work upon between the figure given above and the prices charged by retailers. However, the proposal has yet to face the ordeal of a parliamentary inquiry; and it may be some time before the coal dealers of Bradford find themselves in the position of having to pay rates for the purpose of financing business competitors. That they may never have to do so, is to be devoutly hoped, in the interests of all parties.

Gas Fitting Extraordinary.

Few persons will be found to complain of the verdict—on the ground of its severity, at any rate—returned by the Coroner's Jury at the recent gas poisoning inquest at Wakefield. That the responsible officials were "guilty of gross neglect, amounting almost to criminality," was a finding which was fully warranted by the facts of the case. It is little short of marvellous that at this time of day such ignorance should exist with regard to the proper fitting up of gas-stoves as was disclosed on the occasion referred to. But, seeing it does exist, it is necessary to give all possible publicity to this distressing fatality, in order that it may serve as a warning to others. Here was a gas water-heating stove, really intended for a greenhouse, fixed in a small bathroom (which would naturally often be used with door and window shut) without even the pretence of a flue communicating with the outside of the room, though the man who fitted it admitted that if the stove had been put in its proper place—namely, a greenhouse—without a flue, it would have affected the plants! From this, it was evidently thought that plants were much more particular in their requirements in the matter of a non-poisonous atmosphere than human beings. Surely such an admission as this is sufficient to justify the verdict, strong as it was, of the Coroner's Jury at Wakefield.

Liquid Fuel on Railways.

It recently went the round of the papers that the Brighton Railway Company have in contemplation the use of liquid fuel for their locomotives, and that they are making experiments on some of their engines. At the last meeting of the Crystal Palace Gas Company, Sir George Livesey counselled gas companies to try to create a new outlet for their tar by endeavouring to dispose of a portion of it for fuel and by burning some themselves, with a view to improving its price, which is at a low level owing to ever-increasing production. He mentioned that the Company had sold some of their tar to a railway for fuel purposes. In this connection, the statement as to the Brighton Company is interesting, as it shows that the attention of the great railway companies is being attracted by the possibilities in this direction. In southern and south-eastern Russia, the locomotives have for some years been burning oil; in the United States above 200 engines on the South Pacific system have been converted into oil burners; and in this

country the Great Eastern Company were the pioneers. The economic aspect is, of course, the main determining one for railway companies, and the protection against miners' strikes and excessive prices is a factor of importance. In a private letter to us, Mr. James Holden, the Locomotive Superintendent of the Great Eastern Railway, says that he has been "using hydrocarbons of all kinds, including coal tar, for the last sixteen years, and is continuing them." The last fact taken in conjunction with the lengthened experience is of no small value. On the Great Eastern engines, through Mr. Holden's experiment and invention, any kind of oil (crude or refined) and coal tar can be and is burned. Rock oil is not a British product; coal tar is. The producers of coal tar should not be slow in making the most of this point, as they may find the railway companies to be very useful customers.

WATER AFFAIRS.

The London Water Supply Last Year.

THE bulky volume issued last week containing a record of the work of the Local Government Board in the past year, furnishes, as usual with these annual reports, a number of valuable particulars in regard to the London Water Supply. We say "valuable," because the sources from which they emanate invest them with an authenticity which the bitterest opponents of the Water Companies would, we imagine, hesitate to question. The President of the Board (Mr. Walter Long) has been furnished by the Official Water Examiner, Mr. Charles Perrin, M.Inst.C.E., as well as by Dr. T. E. Thorpe and Mr. Allen Stoneham, the Government Analyst and the Official Auditor, with full details of their work; and these he has summarized in the report bearing his signature—a document which, in a couple of hundred pages, presents a digest of the seventeen appendices following it.

Turning first of all to the statistics given by the Official Water Examiner, we find that the total population supplied by the eight Metropolitan Water Companies on the 31st of December last was approximately 6,307,230, compared with 6,165,490 on the corresponding day in the previous year. The average population served during the twelve months was 6,235,293, against 6,092,536 in 1900. The total average daily supply was 215,069,948 gallons, representing a consumption of 34·49 gallons per head, compared with 34·8 gallons before—a difference of rather more than 2½ pints. During the year 1900, about half-a-gallon less water was consumed per head than in 1899. The sources of the supply were, of course, the Thames, the Lea, the springs in the valley of the latter river, and the wells in the chalk and greensand formations. An additional well was brought into use last year; bringing up the number to 39. The volume of water delivered from these sources amounted to about 78,500½ million gallons, 58·91 per cent. of which came from the Thames, 19·06 per cent. from the Lea, 21·97 per cent. from springs and wells, and the infinitesimal remainder (0·06 per cent) from ponds at Hampstead and Highgate —used for non-domestic purposes only. Of the entire bulk of water coming down the Thames last August, 43·2 per cent. was withdrawn for the supply of London, whereas in April the quantity taken was only 5·6 per cent. In August, 1897, however, it was 23·5 per cent.; while two years later it was as high as 64·8 per cent. The average daily discharge of the Lea, added to the quantity abstracted above Feilde's weir by the New River Company, amounted to 108·3 million gallons in April, and 28·9 million gallons in September.

With regard to the quality of the water supplied, 1216 samples were examined, and the results show that last year the Thames and the Lea were generally favourable for the storage and filtration operations of the seven Companies depending upon these sources, though, owing to floods in the early months of the year, the supplies of the Thames Companies possessing the least storage showed considerable fluctuations in chemical quality during this period. Nevertheless, the river was in good condition for 311 days, and "exceptionally muddy and turbid" on 30 days only. Compared with the standard of 1000—representing the mean amount of organic impurity in the Thames water delivered in 1868—the figures for the Thames and Lea respectively were 818 and 597, compared with 749 and 541 in the preceding twelve months. The mean proportion of organic matter in the Kent Company's water, referred to the same standard, was only 219. Though these figures show a slight inferiority in the year's supply, Dr. Thorpe points out that the organic matter present in the waters after undergoing the processes of storage and filtration is to a relatively large extent of vegetable origin; and he takes the opportunity of emphasizing the importance of storage, especially when the rivers are in bad condition. He shows clearly that the Companies possessing reservoirs of the greatest capacity delivered the best water last year; and he regards it as probable that even better results might be achieved if greater attention were paid to the state of the river at the intakes, and by more frequently drawing upon the available stores. Dr. Thorpe reiterates his remarks of last year that, provided certain flood water is excluded, and river water efficiently filtered after storage, the risk of danger to the public health from its consumption is "reduced "to a minimum, if not to zero." The actual capacity of the subsidence reservoirs belonging to the Companies was the same last year as in 1900. The East London and West Middlesex Companies have, proportionately to their respective districts, the largest accommodation; the reservoirs of the former Company holding 29·3 days', and those of the latter 17·8 days' supply.

There was a considerable extension last year of the constant supply system; the total number of houses thus served on the 31st of December being 893,503, or 26,276 more than on the corresponding day of the previous year. At the above-named date, no less than 95 per cent. of the entire number of houses supplied by the Companies had the water always on; and within the Metropolis there were 1829 miles of streets in which the mains were constantly charged. With the gradual extension of the unquestionable boon of a full supply of water at the command of the consumers, vigilance has been necessary in order to check waste; and excellent results have followed the systematic inspection which has been introduced of late years. With the view of effecting still further economy, the Companies proposed to have an amended set of regulations under the Metropolis Water Act, 1871; but these, it will be remembered, were withdrawn during the course of the public inquiry into the matter by the Board's Inspectors. An important event of last year was the preparation by the Companies, at the instance of the Board, of a general scheme of intercommunication, and its sanction by an Order dated the 13th of July. Every addition to the work of this character which has been already executed, renders more remote the possibility of a repetition of the troubles which arose in the East-end of London a year or two ago, during a period of exceptional drought. Stock to the amount of £87,480 was issued last year for this special object; while on the works generally a sum of £751,121 was expended. The total capital outlay by the eight Companies up to the end of the year was £19,641,090, exclusive of £1,066,668 spent by the three interested in the Staines reservoirs scheme. The net profit realized was £1,008,548, of which £1,004,087 was used for the payment of dividends.

We have, as concisely as possible, indicated the position, on Dec. 31, 1901, of the important undertakings which, if the intention of the Government to pass the London Water Bill, as expressed by the Prime Minister on the reassembling of Parliament last Thursday, is carried out, will before very long be in the hands of a public authority. The particulars given bear evidence of the constant endeavour of the Directors of the undertakings to maintain them in a condition of efficiency; and this should have due consideration when the time comes for appraising their value on the transfer.

A stray electric current fell foul of a gas-pipe on a viaduct in Worcester (Mass.) a short time ago, and produced results which were immediately attributed to electrolysis. According to the "Engineering Record," the viaduct rests on abutments on either side of a street and on a row of riveted columns. A 2-inch gas-pipe touched a column, and formed the only good ground connection of the whole structure. Two trolley lines pass under the bridge, and the hangers for one of the wires became loose and allowed it to touch the metal work. When this occurred, it was naturally troublesome to keep the circuit-breaker in place in the power-house, for a large part of the current was passing into the earth through the pipe. An investigation showed that about 3 feet of the gas-pipe was practically burned out, and the cement in one of the joints was fused into glass.

ESSAYS AND REVIEWS.

GAS ACTS FOR 1902.

In the "Journal" last week, we concluded our abstracts of the Acts so far as Companies were concerned. The following relate to Local Authorities.

The Abercarn Urban District Gas Act empowers the Urban District Council of Abercarn to purchase the undertaking of the Abercarn and Newbridge Gas and Water Company. The sum to be paid in respect to the transfer is £10,875. The limits of the Council for the supply of gas are the district and the parish of Mynyddy Colwyn, in Monmouthshire. Consumers' fittings may be specified. Gas of 15-candle power is to be supplied at the maximum prices of 5s. per 1000 cubic feet in the district, and 6s. beyond. Power is reserved to the Local Authority for the parish already named to purchase their portion of the undertaking at any time. The sum of £20,000 is to be borrowed for additional gas capital, repayable in forty years. Discounts are allowable of 10 per cent. for prompt payment, and 20 per cent. for large consumptions.

The Bradford Corporation Act contains a part relating to gas. The Corporation are empowered to purchase the undertaking of the Clayton, Allerton, and Thornton Gas Company, the Airedale (Idle) Gas Company, and the Eccleshill and Bolton Gas Company, respectively, upon terms contained in a scheduled agreement. The charge for gas within so much of the added area as is in the city is to be the same as for other parts of the city, and in the outlying portion of the added district, 8d. per 1000 cubic feet more, subject to the city scale of discounts. Outlying Local Authorities may purchase their portion of the undertaking at any time on giving six months' notice and obtaining permission from Parliament or the Local Government Board. Additional gas capital is to be obtained by sanction of the Local Government Board, to be repayable in twenty-five years.

The Buxton Urban District Council Water Act contains the provision that the Council, being owners of the gas-works supplying the district, may manufacture and supply, for purposes other than illumination, any gas other than coal gas. Such gas is not to contain more than 14 per cent. of carbon monoxide, and must possess a distinctive and readily perceptible smell. A penalty of £50 attaches to contravention of this enactment; and powers of seeing to the execution of the law are placed with Government Inspectors. This supply is to be subject to any future General Gas Act.

The Knaresborough Improvement Act contains a part relating to gas, by which the limits of the Town Council for the supply of gas are defined to be the urban district, the parish of Scriven, and that portion of the parish of Knaresborough Outer lying to the north-east of the River Nidd. Consumers' fittings may be specified. The Council are protected from being penalized for default or defective supply due to unavoidable cause, or of immaterial character. The maximum price of 14-candle gas is 4s. 6d. per 1000 cubic feet. The gas is to be tested on the works or within 200 yards from any part thereof. Pipes may be laid and used for ancillary purposes. The Act of 1823 is partially repealed. Additional gas capital can be borrowed by sanction of the Local Government Board, to be repaid within such period as they may prescribe. Surplus gas profits are to be carried to the district fund.

The Leamington Corporation Act contains a clause repealing the statutory powers of the Corporation for purchasing the gas undertaking, and declaring null and void the notice to sell served by the Corporation upon the Company.

The Leicester Corporation Act contains a part relating to gas. Additional gas lands are scheduled for manufacturing and storing gas. The laying of a new trunk gas-main is sanctioned. A clause is inserted for the protection of a landowner in respect of this extension. Additional gas capital to the amount of £500,000 is sanctioned, repayable in forty years.

The Omagh Urban District Gas Act provides for the transfer of the undertaking of the Omagh Gas Company to the Urban District Council. The power to do this was reserved to the Local Authority in the Company's Act of 1901. The limits of the Act comprise the district and so much of the parishes of Drumragh and Cappagh as lie within a distance of 2½ miles from the centre of the existing gas-works in the town. In addition to the ascertained value of the property, the Council are to pay to the Company the costs of obtaining the Act of 1901, and the winding-up expenses. The value of the stock-in-trade is to be paid within fourteen days of the transfer. The maximum price of 15-candle gas is 4s. 6d. per 1000 cubic feet. Discounts up to 10 per cent. may be allowed. Surplus gas profits are to be carried to the district fund.

The Rhondda Urban District Council (Tramways, &c.) Act contains a part relating to gas, which enacts the provisions now usual with regard to the hiring-out of stoves, the period of error in defective meters, the avoidance of penalties, and so forth. In the tramways part of the Act, there is a clause for the protection of the Ferndale Gaslight and Coke and Water-Works Company in respect of their mains, requiring among other things that the mains of the Company shall be as well protected from fusion and electrolysis as the property of the Council. (This is the Act which contains the precedent requiring the Council to satisfy the Board of Trade that the execution of the powers of tramway construction will not throw any financial burden on the rates.)

The Whitstable Water and Improvement Act contains a part relating to gas, under which the Gas Company will be required, within two years, to sell their undertaking to the Urban District Council. The maximum price of 15-candle gas is 4s. per 1000 cubic feet. Consumers' fittings may be specified. General powers are taken for the raising of gas capital, to be repaid in thirty years. Gas profits are to be carried to the credit of the district fund.

The Ystradfellte Water Act empowers the Neath Rural District Council to acquire the Cwm Avon gas undertaking, owned by Wright, Butler and Co., Limited, upon agreed terms set out in a schedule. The gas limits consist of the parish of Michaelston-super-Avon Lower. The maximum price of 14-candle gas is 5s. per 1000 cubic feet. Penalties for neglecting or refusing to give a supply of gas in accordance with the provisions of the Act, or for defects of the supply, are not to be incurred by the Council in cases where the Court shall be of opinion that the cause was due to circumstances beyond the control of the Council, "or was of so slight or unimportant a character as not materially to affect the value of the supply." The rights of the Corporation of Aberavon are protected. The cost of the acquisition of the gas undertaking is put at £1700, and is repayable in forty years.

THE COAL TRADE AND LABOUR TROUBLES: CHANCES OF PEACE IN SOUTH WALES.

The acute stage of the strike of anthracite miners in America has not, fortunately, been of great duration; the end having been reached in about three weeks from the time when the scarcity of coal in the States first made itself generally felt and forced the question to the front place in the public mind. We deal elsewhere with the terms and history of the settlement; and are here concerned only with the question of its influence upon the coal trade in this country. There seems no ground for doubt that, before the end of this week, the majority of the miners will be back in their places and the mines will have begun to put out something like the normal quantity of coal, though it must be remembered that a coal mine that has been standing idle for months cannot be set going again simply by starting the winding machinery. But it is certain that it will be some weeks before the supply of coal in the States can catch up with the immediate demand for it, especially considering that we are now at the commencement of the winter season, and the consumption of coal will be increasing daily for some time to come. How long it will be before the output has been sufficient to bring the market in America down to a normal level—that is, not only to meet fully the current demand, but also to replenish the empty stores—it is not easy to estimate; but it does not appear possible that the effects of the strike can be left out of calculation this side of next spring.

This, of course, is not to say that the extraordinary pressure of demand in the markets of this country during the past two or three weeks will not, so far as it has been occasioned by the American strike, be relaxed long before then, but the effects of the orders that still remain to be, and doubtless will be, executed for American buyers must be felt for some weeks to come; and it is obvious that it will be months before American coal can again be competing with British in foreign markets. Shipments of coal from this country since the beginning of the year already (as will be seen from figures given elsewhere) exceed the record for the same period of last year by nearly a million tons, spite of largely reduced exports to Northern Europe; and this increase is mainly due to the impossibility of America sending coal in any quantity to the Mediterranean, South America, and the Indies as she had been doing for some time before the supply failed to meet the home demand. While, therefore, the coal consumer in this country has every reason to be heartily thankful that the labour trouble is apparently at an end in Pennsylvania, it would be unwise to ignore the fact that its effects will be felt for some time yet to come. This is especially likely to be the case in view of the circumstance that there is an immense volume of business awaiting execution by the iron and steel makers in the States as soon as they can get adequate fuel supplies, so that there is not likely to be a glut of coal there for many months.

The coal consumers' troubles are, however, by no means exhausted when we have considered the extent to which their chances of cheap supplies are prejudiced by the situation across the Atlantic. The strike in France, at the time of writing, is still in being, though opinion there inclines to the belief that the collapse of a movement which is much more political and social than industrial is not far distant. It is to be hoped that this belief is well founded; for, though the French miners' strike is attracting much less public attention than the American dispute, its effect upon the British coal market is bound to be much greater, if it should last long enough for the stocks of coal in France (which, fortunately, are stated to be heavy) to be depleted. As it is, orders have been freely arriving both for Welsh and North Country coal for prompt shipment to France; and prices

everywhere are very firm. We are rather surprised to see an able a journal like the "Statist" making so illogical a remark as that, "whatever the demand from France may become, there is this to remember, that she is now our largest foreign customer for coal, and that any rise or fall in her requirements cannot have the phenomenal effect on our markets that the exceptional demand of a non-customer like the United States has had." In what way any difference in the destination of increased exports of coal can alter the effect of the removal of the coal from the home market, we are unable to discover. If France should draw an extra 100,000 tons a week from this country, the fact that she already draws about 140,000 tons every week from the same source will not make the slightest difference in regard to the inconvenience caused to home consumers.

Taking the hopeful view of the situation, and anticipating an early settlement of the labour disturbances in France and Belgium (where the miners are threatening a strike for higher wages, "in order to assist their French brethren"), we have not yet reached the end of the labour troubles that beset the coal buyer, who in the past four years has had to suffer the effects of the great strike in South Wales (1898), the strike of Bohemian miners (1900), of French miners (1900), of anthracite miners in America (1900), of the Taff Vale strike (1900), and of the recent strike in America and the present strike in France. And now he has to look with questioning eye towards South Wales, and wonder what the next few months have in store for him there. The Welsh coal owners held a meeting on Saturday week to consider the position, and, we understand, arrived at exactly the decision to which we should have expected them to come—namely, to refuse to substitute for the system of regulating wages by a sliding-scale that of putting the determination of rates of wages into the hands of a Conciliation Board in connection with that which governs wages in the Federation districts of England. The idea of the coal owners appears to be a sliding-scale (as at present), but with a maximum and minimum limit as to range. There can be little doubt that their determination to have nothing to do with the men's plan of a Conciliation Board was greatly strengthened (if, indeed, that were necessary) by the scheme adopted by the Southport conference of the Miners' Federation —namely, to bring all the coalfields affiliated to the Federation under one Board at the end of 1903.

The promulgation of this scheme of the Federation officials, involving a uniform rate of wage in all districts, however widely the local working and trading conditions may differ, and having for its aim the Trade Unionist's ideal of regulating prices by wages, has undoubtedly come at an awkward time for the men's leaders in South Wales, and may prove the means of breaking the bond between the Federation in Wales and the Federation in England; for there are not wanting signs that the Welshmen are not now very keen for a fight, realizing that public opinion would be generally against them. "Mabon" made a speech yesterday week in the Rhondda district, which we interpret as meaning that the men will not, if guided by him, press the question of a Conciliation Board to a fight; and it is upon similar ground, we take it, that the special correspondent of the "Colliery Guardian" bases his belief in a peaceful issue of the pending negotiations. "Mabon" declared that he had too much faith in the "wisdom and good sense" of the miners in other parts of the federated area, to believe that they would force "anything impossible" upon South Wales. His Union would make "an honest effort to get into line with the other districts;" but if they failed, he did not think their friends of the English Federation would make South Wales the cockpit wherein to fight their battles. It is easy to read between these lines—the "anything impossible" being, of course, a Conciliation Board—and, unless "Mabon's" hands are forced by Messrs. Pickard and Company (in whose "wisdom and good sense" we have not quite so much faith as he has) or the rank and file in South Wales, after being drilled for a fight and primed with arguments against or, rather, denunciations of, the sliding-scale, refuse to agree to its renewal in a modified form, the struggle which the truculence of the leaders until recently promised to make inevitable may yet be avoided.

COAL AND IRON EXPORTS.

THE Board of Trade returns for the month of September, like those for the preceding months, bear witness to the marked influence that the state of the iron and steel markets in America is having upon the trade of this country. The net exports of iron and steel from Great Britain during the month of September show an increase, compared with last year, of 80,788 tons. Of this quantity, 70,133 tons went to the United States; the balance being due to improved trade with South Africa and Japan. For the first three quarters of the year, the net exports to all countries show an increase of 175,000 tons compared with 1901, and a decrease of 748,000 tons compared with 1900.

If our trade with the States had not altered as it has done, these figures would have been turned into a decrease of 227,000 tons over 1901, and of no less than 1,168,000 tons compared with 1900; and the state of depression in the iron, steel, and coal trades would have been very marked. In fact, it is only in the case of raw iron and steel that the beneficial effects of the "boom" in America are felt; the manufacturers of finished goods being at present between the upper and nether millstones of dearer raw material and a poor demand for the manufactured product. So that, while pig iron is quoted at 53s. 3d. (Middlesbrough) and 60s. (Glasgow), as compared with 45s. 6d. and 53s. 7d. a year ago, steel angles are quoted at 5s., and ship plates at 5s. to 12s. 6d., per ton less than in October, 1901, while iron bars stand at last year's figures. And, in view of the competition of Germany and Belgium, it is impossible for these quotations to be raised materially. Our exports of iron and steel to Germany alone are 93,000 tons less this year than last, and 303,000 tons less than in 1900; while our imports from that country have increased. Trade on the Continent is, in fact, in a very poor way, and but for the demand from America would be considerably worse. The extent of the demand is shown by the following brief statement of facts: In the first eight months of this year the States imported altogether 583,745 tons of iron and steel, and exported 278,195 tons—a net importation of 305,550 tons. In the corresponding period of 1901, the imports were only 119,568 tons, the exports 512,312 tons—a net exportation of 392,744 tons. So the international balance of trade was affected to the extent of just upon 700,000 tons.

Exports of British coal, however, continue to increase; and as the returns for September do not include much coal sent to the United States (though our exports generally have been increased by the absence of competition from America in distant markets), there is every reason to anticipate a continuance and a swelling of the rate of increase—for the time being, at any rate. Last month the shipments of coal, coke, and patent fuel (including "bunker" coal, an ever-growing factor), amounted to 5,336,177 tons, compared with 4,912,485 tons in September, 1901, and 5,140,708 tons in September, 1900. This brings the total for the nine months up to 43,932,233 tons, or 1,002,183 tons more than in the same period of last year, and 845,481 tons more than in the first three quarters of 1900, for which period the shipments then constituted a record. As the exports of coke and patent fuel both show a decrease compared with 1901 (the first year for which the figures are separated), the actual increase in the shipments of coal is about 150,000 tons more than that shown by the total figures for all kinds of fuel. In spite of the decrease in coke exports, the market (owing to the improved output of iron and the demand for anthracite and coke for the States) is in a very healthy condition.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1095.)

THE Stock Exchange has had a better week. It began badly with deep uneasiness in regard to things across the Atlantic; and this feeling spread some shadow of its gloom over other markets. Some reported failures, too, were not exhilarating. But a more hopeful view of the prospect of settling the coal strike soon supervened. Prices mended; and the subsequent announcement of an agreement to arbitrate, confirmed the recovery. So that the week finished with a general brightening of things all round. But business was on a very moderate scale, and the public are still holding severely aloof. In the Money Market, there was an abundant supply to meet the demands of the Stock Exchange settlement, and every other requirement at easy rates; but discount was steady. In the Gas Market, transactions were decidedly limited on the whole; and on no single day did the volume of business attain mediocrity. There were not many changes in quotation; and they were somewhat mixed. The tendency was rather towards lower figures; but when a good thing was offered at a cheap price, it was readily snapped up by those who understood its real value. And prices are not always indicative of worth. In Gaslight issues, there was moderate business daily in the ordinary stock, which continued to improve on its advance of the previous week. The figures at which it changed hands were remarkably steady, never getting outside the limits of 89-90¼, and the quotation advanced a point. The secured issues were quiet and unchanged. South Metropolitan was not particularly active, and was chiefly noticeable for the steadiness of the figures at which it was dealt in throughout the week—say, 132½. Hardly anything was done in Commercials. On *ex div.* adjustment, the quotation was marked down a little. As the Company's last accounts are the best they have shown for some time, the price ought to be good for buyers. There was nothing to call for notice in connection with the Suburban and Provincial Companies beyond the lowering of a couple of points in Brentford new, probably in view of the minimum price asked by the Directors in their approaching issue being fixed at 180. A fair amount of business was done in the Continental Companies; but it did not lead to any change in quotations, though Union preference, which was not dealt in, had a fall. Among the remoter undertakings, there was a rise in Hong Kong. In the Water Companies, there was a little more animation coupled with a tendency to higher prices. East London and West Middlesex fell.

As to the daily operations, there was no change in quotations on Monday. On Tuesday, Union preference fell 2½. Wednesday was a blank day. On Thursday, Brentford new fell 2; but Hong Kong rose ½. In Water, East London fell 4, and West Middlesex 5. On Friday, Gaslight ordinary rose 1.

ELECTRIC LIGHTING MEMORANDA.

The Electric Light in St. Paul's—A Ghastly Failure—Public Disappointment—The Combination of Gala and Utility Lighting.

Among the show-places of London, as regards interior lighting, it must be regretfully conceded that the great Cathedral of the Empire, St. Paul's, cannot be included. The story of the introduction of incandescent electric lighting into the Cathedral, through the liberality of Mr. Pierpont Morgan, has often been told; and the completion of the first portion of the fitting, at what is probably the greatest cost ever incurred for a similar object, was made a good deal of in the Electrical and General Press. There were the usual "private views," which are meant to have public results; and the new pendants designed by the Architect to the Chapter were duly illustrated and praised in these publications. We have been waiting for some independent and spontaneous criticism of the whole arrangement, from one of the artistic persons of note who make it their business to instruct the British public in all matters of taste. Nothing of the kind has appeared; or, if it has, it has escaped our notice. Perhaps some habitual readers of these "Memoranda" have been more fortunate in gathering an expression of cultured judgment on this important example of Twentieth Century Renaissance art work. If so, we should be glad to be put in possession of it. One cannot read every periodical publication, and there are so many that profess to deal with matters of art. Meanwhile, we venture to express the deliberately-formed opinion that the St. Paul's electric lighting—both the lighting and the fittings together—is a disheartening failure. This is no opinion given on the spur of the moment; and it is not inspired or influenced by any personal or other prejudice. We simply state that the lighting of St. Paul's is bad, and that a great opportunity of exemplifying what the art of the Twentieth Century can do to make good the deficiencies of the Seventeenth Century has been lost.

This judgment is, of course, itself open to criticism; and we hope that those who read it and are at all interested in the subject will make it their business, as it will certainly be their pleasure, to attend an evening service in the Cathedral during the winter. It is hardly necessary to remark that St. Paul's is very much alive indeed to the responsibilities and privileges of a Metropolitan and Imperial Cathedral. Probably never before have the energies centred in it been so active and so powerful. This reflection makes the dismal failure of the lighting all the worse to bear. We challenge any individual with eyes in his head, and the smallest sense of the fitness of things architectural in his mind, to see St. Paul's lit as it now is without feeling profoundly disappointed with the general effect. If he happens to be favourably placed with respect to one of the pendants, he will be able to read for a brief period print of the character here employed. But as for architectural effect—for the bringing out of the main lines and proportions of the building, to say nothing of the decorations—there is none. The splendid creation of the genius of Wren, the noblest realization of the style in the whole world, is lost to sight when the shades of evening close in.

Just fancy the disappointment of an American or Australian who may happen to have only one evening of a lifetime for his pilgrimage to St. Paul's, when he discovers to his dismay that he cannot see it on account of the badness of the light. One wonders what, in his heart, Mr. Morgan himself thinks of the return for his money. Not only is the first impression unfortunate, but a subsequent glance at the details also fails to give satisfaction. The new pendants in the chancel and under the dome do not look at home. They are not of a piece with the rest of the interior, and are at the same time offensive and ineffectual. One may make quite sure that if, in the familiar terms of Wren's epitaph, the great architect were willing for those who might seek his monument to look round the building, it would not be by night, in the present state of things. And when one thinks of what good and appropriate lighting can do for a great cathedral—of how the solemnity of the service, the impressiveness of the massive work of the faithful departed, who seemed to build for eternity, can be enhanced by this means of producing an additional effect—the miserable failure of the actual performance seems to cry shame upon its perpetrators. It is not that the gas lighting which has been discarded was all that might have been desired, from any point of view. It was of long standing, as gas lighting goes, and much of it was open to be improved; but there can be no question that it was, on the whole, effective decoration.

It was high time for the lighting of St. Paul's to be taken in hand. The elaborate embellishment of the arches of the chancel and the dome, originally left plain for want of funds, was inconsistent with the method of lighting architecturally which did no harm to the bare stone. But what is mainly to be complained of is that the new lighting is distinctly un-architectural and non-decorative. There are interiors which can only be properly described as lighted when the lights partake of the character of illuminations as well as being useful and necessary for whatever may be the purpose of the building. This dual character of lighting is exhibited in its extreme development in the "gala" appointments of an opera-house. So far as the immediate purpose of the performance is concerned, the "house" is better left in darkness while the stage is lit up according to the needs of the scene; but that is not the idea of a gala night. Not to labour the point, which should be obvious, one would imagine, to the trained eye of the artist, it is clear that the style of lighting of St. Paul's is not to be classified with that which would be correct for a small conventicle or a temperance hall. Yet this point has been missed by the Architect of the day, with deplorable results. It will be observed that we are not finding fault with the choice of electric light for the so-called lighting of St. Paul's. That choice was natural, and even inevitable in the circumstances. The electric light has the reputation of being the most perfect artificial light available at this present time. Its partisans will not hear a word against it, nor admit that any other means of lighting is worthy of being mentioned in the same world with it. So be it. Only, whatever means of lighting is preferred, the ultimate objects are one and the same. There may be both bad and good lighting, having regard to the standards of excellence proper to the particular case, with almost any kind of light. Even where the actual lighting is little better than a name, the element of picturesqueness may bulk largely, and secure for an effect of torches or Chinese lanterns a success denied to the most improved arc lamp in the market. Lighting for effect is, in short, an art, and, as such, requires an artist to do it as it should and can be done with any prescribed means. Unfortunately, the artist is not always to be found in the man who has to do the work, be he architect, electrician, or engineer. It is a scenic artist who is wanted; and he must be born. The birth-rate of this order of the population was never high, and it does not appear to have increased with the advancement of science and the accumulation of wealth.

POINTS AND EXAMPLES IN GAS-FIRE WORK.

In making their preparations for the present season, some makers of gas-fires have been giving special attention to the smaller type of goods. They apparently recognize—and there is no doubt they are right—that many gas consumers are averse to placing a gas-fire in front of the old coal grate. There is something of a makeshift appearance about it that does not accord with people's ideas as to what is fit and right. Examples of such work in drawing-rooms that look clumsy, unfinished, and do not by any means harmonize with the pretty, delicate surroundings are, we are sorry to say, too common; and in other cases, the large frame of a new gas-fire—the more handsome its exterior the worse—is often spoilt, and the contrast is ugly and incongruous when the setting is a fire-place that presents the unmistakeable signs of age. The new and the old will not always blend or match, any more than will a piece of new cloth on an old coat.

The "Reform," with "Excelsior" Fire.

The remedy is, of course, to take out the old fire-place and supply a proper tiled or enamelled sheet-iron recess in which to place the new gas-fire. But there are not many consumers, suffering from the disadvantages referred to, who are willing to go to the necessary expense to make a good, becoming job of the change, especially in houses which they merely hold as tenants, and not as owners. They foresee the possibility of having, at some time or other, in the event of leaving the house, to spend further money in reviving the old conditions; and this—very naturally—they say, using a trite phrase, "is not good enough."

It is to the meeting of the wants of this considerable class of householders, and those whose fire-places are unsuitable to the large type of gas-fire, that the makers have been turning their

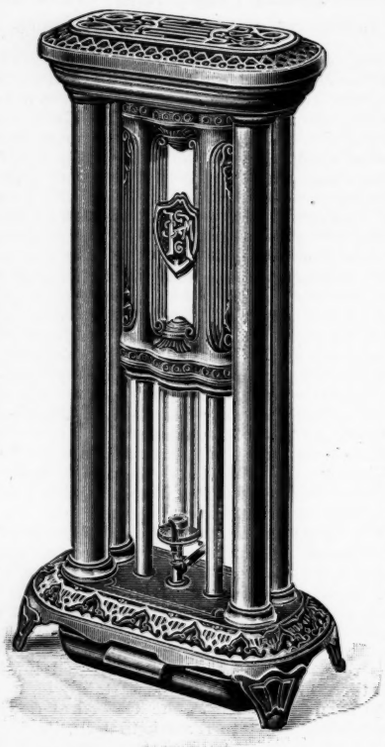
attention of late. Among them are the Richmond Gas Stove and Meter Company, who have called our attention to some of the noticeable features of their new work in this line. They have, among other things, commenced the heating season with the introduction of the "Reform" fire. This fire is of a size that, by simply removing the front bars of the old grate, it can be placed in the recess below the canopy, and so appear as part of the ordinary grate. The fire is supplied in three sizes, to suit varied conditions; and it is made in two forms—either of ball fuel, or a composite fire of shaped brick, convoluted iron frets, and asbestos fibre—a combination of the advantages of the three universal systems of retaining and radiating the heat generated. The name given to the composite form of fire is the "Excelsior." In examining a specimen, the ease with which even a consumer can renew any part, without calling in outside aid, was a feature that commended itself. The overhauling of the fire is indeed a simple matter. After lifting out the trivet, the side wings can be removed by merely taking out two screws from each. After releasing the side wings, the whole of the fire-brick and frets can be lifted out. The former is in two sections, between which are inserted the supports for the frets—five in number—which are simply slid into their places. The burner, too, is merely supported in position by a couple of lugs, and so can be readily released. All that there is left then is the skeleton case. The wisps of asbestos fibre are fastened to the frets by a small headed screw and nut; and therefore, at the cost of a few pence, the consumer can himself renew both frets and asbestos fibre—the only parts that are likely to be affected by long and continuous use. This is a consideration.

THE "SHAMROCK," WITH "EXCELSIOR" FIRE.

In use, the fire has a novel and pretty appearance, which we rather fancy will meet the views of the housewife. The combination of the frets and wisps of asbestos gives a distinctive and novel feature to the fire. The red-hot frets look like stems bearing brilliant flowers of fire, the slight movement of which, caused by the flame playing on them, gives life to the fire that cannot be obtained with ordinary asbestos fuel. There is nothing new in the use of asbestos fibre for gas-fires; but the manner in which it is used makes all the difference. The fire can be adapted to the Company's existing patterns with 10-inch and 13-inch fire surface, as depicted in the above photographic illustration of a converted "Shamrock" stove.

A careful test of one of the fires, made in a room 16 ft. 6 in. by 13 ft. 8 in. (with 2 ft. 3 in. deep bay), by 10 ft. high, shows that it is powerful in its heating effect. With two windows in the room, and a good inlet for fresh air under the door (windows and door being closed), a thermometer, hanging 3 ft. 6 in. from the floor, central in the area of the room, registered 58° before the fire was lighted. A quarter of an hour after the fire was lighted, the temperature was 62°; half an hour later the mercury was standing at 66°; and at the end of an hour at 68°. The gas-tap was, during that time, turned nearly full on; but, on being turned off about half, the temperature of the room at the end of the next hour had only suffered a diminution of 1°. Altogether it may be anticipated that there will be a good demand for this new fire, which is both ornamental and useful, and has a scope of adaptability beyond some of the ordinary types of fire.

The firm's new designs embrace several classes of heaters from which one or two others may be chosen for brief notice. First, there is the "Surrey" syphon condensing-stove. This is a very attractive design of the argand type, embodying several improvements, which will add materially to the efficiency of this type of heater. As the heat emerges from the argand chimney, it enters a cast-iron duplex radiator, the form of which gives a large effective heating area; and by a special arrangement of tubes, the circulation of the gases in process of condensation is made, we are informed, more effective and definite and the temperature more uniform. Finished in the firm's new "Porcellanite" enamel, a rich faience effect is produced. This stove is made in two sizes, and is suitable for many situations. Among other novelties may be mentioned the "Guildhall" condensing radiator—the name of which is suggestive of a wide range of adaptability in halls, shops, &c., &c. The "Devon" is also a new large tubular reflecting heater of good design and finish.



THE "SURREY" CONDENSING STOVE.

Now no one will dispute that progress towards perfection is usually made by short steps—seldom by great leaps; and in the transition (which is slowly, but surely moving) from the wasteful and dirty coal fire to the more cleanly and scientific method of utilizing the forces of Nature in the gaseous form, it was but to be expected that some undesirable features of the crude system should cling, for a time, to the new development. In the gas-stove this tendency showed itself—all too long—both in the retention of the old form of fire-place and in the dismal black finish which prevailed almost universally in the past. We have frequently urged reform in these respects. This article and the pages of the "JOURNAL" recently have exhibited an effort to strike out into new fashions in form; and it is a further pleasure to note a decided trend to a brighter and more permanent style of finish in fires, and a finish that will give less trouble to users than some of the old types. We believe that the difficulties in the way of the successful application of vitrie—or fired—enamels upon the ordinary iron castings of gas fires and stoves have been many and great; but they are being rapidly overcome, and a rich variety of specimens are now produced.

While describing the new fires of the Richmond Company, it will not be out of place to mention that they have adopted a new enamel finish for their fire casings, to which they have given, as already incidentally mentioned, the descriptive title "Porcellanite," and in connection with which they have laid down at their Warrington works a complete enamelling department, fitted with the most modern appliances for the expeditious treatment of large quantities of castings. As seen, they are busy upon a variety of rich effects upon their running patterns of fire, as well as upon some of the new and original designs. Some of the stoves so decorated have been brought to notice; and the "Shamrock" and "Waverley" in rich majolica brown, and the "Louis XIV." in green, present fine effects.

Speaking generally, the artistic decorative merits of gas-fires enamelled in colours have not been brought with sufficient prominence before householders; but we feel some confidence that, if they had their attention more directly called to them by gas companies and authorities, the gas consumers who have a taste for the bright and beautiful would appreciate them, with gratifying results. The little work which fires covered with coloured enamels entail upon users, is also a point in their favour. Just an occasional rub with a cloth, and their native freshness is restored. Subjected to tests of some duration, and at a powerful heat, the enamelled surfaces of two fires mentioned in this article have not been affected in the slightest degree.

The Edinburgh Association of Science and Arts have awarded a bronze medal to Mr. Hugh Marshall, D.Sc., of Edinburgh, for a communication in the course of last winter on "The Use of Carburetted Air for Lighting."

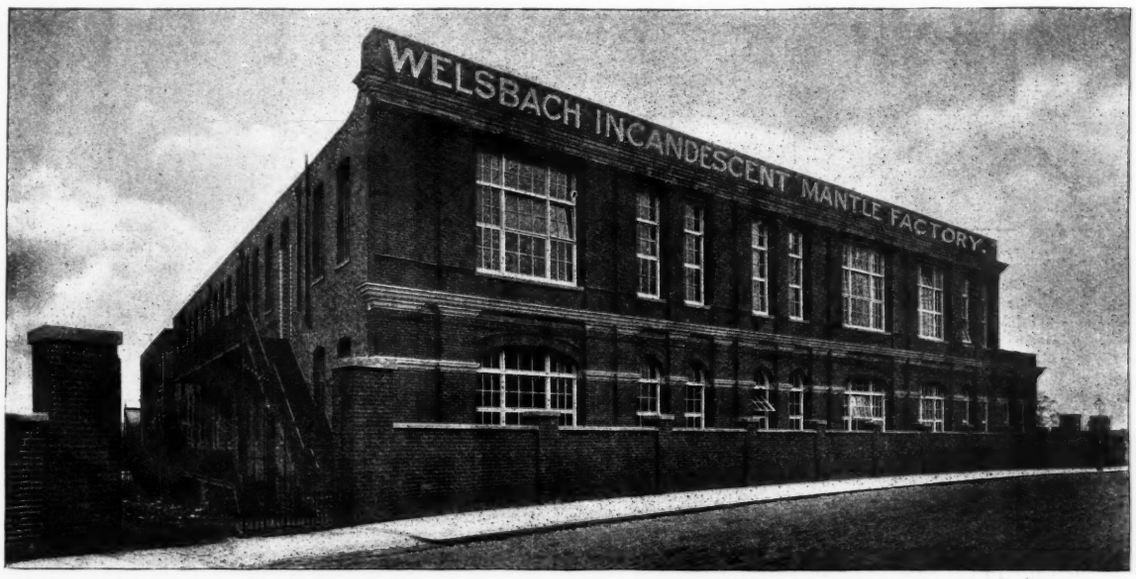
THE MAKING OF WELSBACH MANTLES.

A Visit to the Company's New Factory.

MANY there are who use incandescent gas mantles; but few there are who know anything, or very little, of how they are made. The small structure—slight and delicate in appearance, but strong in its useful performance—is taken from the box which has protected it from injury since the hour it left the factory to the time it has reached the gas consumer's hands, is placed on its supporting rod over the bunsen burner, the toughening coating is burnt off, and the mantle is ready for service. But rarely, it may safely be said, is a thought given to the several processes to which the mantle has been subjected in its preparation, nor to the many hands through which it has had to pass before it arrived at the scientifically perfect body that is about to render its destined service. All that the ordinary user knows about the mantle is that it is the best and most economical "enricher" of the light to be obtained from the gas supplied—raising, as it does, the illuminating power of the 2 to 3½ cubic feet of gas consumed six, seven, or eight fold, and, according to the size and the type of burner used, even more. There is indeed no form of gas enrichment known to the gas maker or the scientist that can do, so cheaply and well, what the incandescent mantle accomplishes for the consumer.

The objects of this article are two—the first is to give an account of the processes through which the mantle has to pass to reach completeness, and to, at the same time, describe the magnificent new factory that the Welsbach Incandescent Gas-Light Company have built at Wandsworth, for the sole purpose of producing these little articles that have caused such a revolution in the gas-lighting world. Perhaps the latter object should receive the first place; but we prefer to intertwine the two so as to interest all readers. Before proceeding, it should be mentioned that the visit to the factory was permitted through the courtesy of the Directors of the Welsbach Company, at the instance of the General Manager (Mr. K. H. Buchanan); and the inspection was made under the guidance of the Company's Chemist (Mr. W. Mackean), who is to have charge of the factory and all the manufacturing operations there.

As one takes a first glance at the new buildings—which appear to have been built of such solidity as to defy the elements for all time, have been designed with admirable discrimination for the special class of work to be conducted within them and for the safety and well-being of the employees, and with plain but neat exteriors, yet presenting a pleasing façade to the public—their very extensiveness causes one to marvel and reflect. The reflection brings to mind the days in the latter eighties, when the original Company introduced the Welsbach mantle to this country. Then a mere handful of girls sufficed—probably not more than a dozen—to meet the requirements of the time. There was also perennial anxiety as to the character of the fluid, and as to where the supply was to come from in sufficient quantities if there was a great demand for mantles. But the girls now employed by the Company are numbered by the hundreds; and



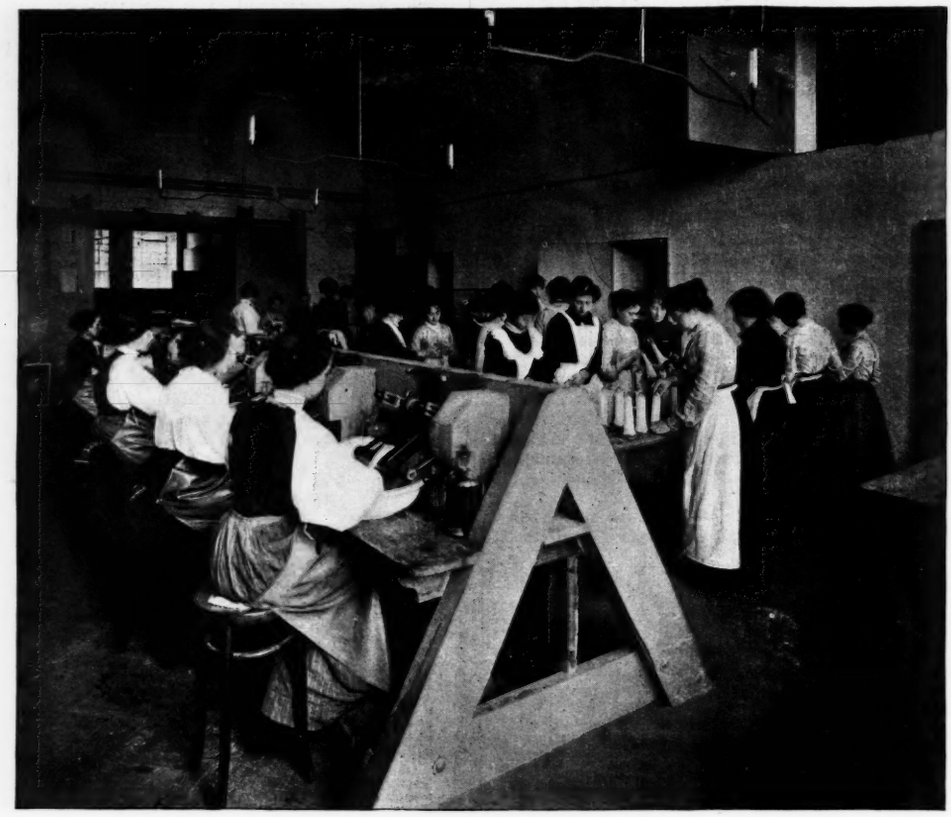
FRONT OF THE WELSBACH MANTLE FACTORY.

there is now no anxiety on the latter score. Well may the position to-day, when brought home puissantly by what is to be seen at Wandsworth, cause one to smile over those days of fifteen years or so ago, and yet wonder (but why, considering all things?) at the tight hold and progress obtained and made by the incandescent mantle in this country.

Let us pause for a minute or two over this point. These new buildings occupy the whole of the central part of the site of rather more than 4½ acres prudently acquired by the Welsbach Company—"prudently" because there is yet ground to spare for future extensions, which will enable a continuance for many years to come of the concentration of manufacture, under one management and constant responsible supervision. In the present buildings, there are some 600 girls busily employed; and, as time progresses and the demands extend, accommodation can comfortably be given, in the buildings already constructed or approaching completion, to some 1400 or 1500 hands, and still have ample freedom for the operations. Last year, under the old circumscribed conditions, about 12 million mantles were turned out from the Company's London factory; while at the new works at Wandsworth, without further enlargement, and under present methods of working, from 18 to 20 million mantles can be produced in a year, and, if machinery which is about to be introduced for trial proves itself capable of all that is expected of it, in the same buildings at least 24 million mantles will be the possible output.

Think of this and of the past; and what it all means. The little mantle, which was at its first coming only impatiently tolerated, has created a new and substantial industry—giving extensive employment in the weaving of the mantle fabrics and in the production of the impregnating fluids and packing cases, and opening up a field for girl labour of no mean order in the development from the raw materials of the perfected mantle, and in their safe packing. But its effect in the industrial world has not stopped there. Just ponder for a moment over what the mantle has brought in its train in the way of the manufacture of special burners, of suitable glasses, globes, and other fittings, and of lanterns and methods for street and large interior illumination. Besides all of which, there is the employment given in the transmission and distribution of these various goods, and in their ultimate fixing. The companion picture—illustrating the capabilities of the mantle as a lighting agent, and its stimulating influence on the fortunes of the gas industry—does not fall within the purview of this article; but it should just be mentioned as a consequential effect to the credit of the mantle. Truly, there is much hidden beneath this superficial sketch to excite both admiration and astonishment.

But to return to the new Welsbach factory which has prompted these thoughts. The main buildings, which have already now been brought into service, are divided into two sections—each containing two floors and a basement—known respectively as Block "A" and Block "B." The frontage of block "A" is 128 feet; the length, 136 ft. 7 in.; and the width, 85 feet. Block "B" is 107 feet wide, 74 ft. 9 in. long, and is separated from block "A"—connection being by two galleries and two bridges 18 feet long. The upper floors are reached by wide external iron stairways and balconies, from which and on to which several double swing doors open the whole length of the building. The slightest push from the interior will open them. This ample provision for egress and ingress is only an example of one of the striking features of the design of the factory—that is, the studied consideration that has been shown for the safety of person and property in case of fire. Brick, stone, concrete, cement, and iron (with a minimum of woodwork) are the materials used in the



IMPREGNATING THE MANTLE FABRICS.

construction; partitions are thick and solid; and every section and department is separated from the next by fire-proof sliding-doors, so that in the event of fire—unlikely under the precautions taken—it can be localized and the damage restricted.

Now let us take a turn round these buildings, under the guidance of Mr. Mackean, and in doing so follow the course of the development of the mantle. The start must be made on the ground floor of Block "A;" and the first two spacious rooms entered are the store-rooms—one for the mantle cottons, and the other for the prepared impregnating fluid. After these, the apartments follow in proper sequence, so that the mantles pass from one stage of preparation to the other and to the finish with systematic order and little labour—all of which tends to smartness and economy in production. In the succeeding apartment, interest is immediately aroused. There at a bench sit half-a-dozen girls, each with a large basin and a small electrically operated machine in front of her. The basins contain the light giving-fluid, into which the loose cottons are dipped, and then passed by the girls to the machines, which draw the soaked fabrics through rolls, and deposit them in trays beneath. This operation squeezes the fluid uniformly into the fabrics, and relieves them of the superfluity. In connection with these machines, it is soon found, by inquiry, that our conductor is not only a chemist but a mechanician; for this method of dealing with the mantles, as well as several other mechanical contrivances about the factory, are due to his inventive faculty, and all have for their purposes economy and exactitude in production and rapidity of output. For example, in this primary operation in the manufacture of a mantle, with the hand machines formerly employed, two girls could only treat some 6000 mantles a day, while now one girl can deal with 12,000; and as there are six impregnating-machines at work, they represent an output of 72,000 mantles a day. Again, before the advent of the machines, 24 girls were employed instead of six for the same work; and now four can easily do the work of eighteen under the old conditions. The machines are driven by a little electrical motor under the bench, which only needs 1·8 amperes of electricity for the operation. At a bench fitted on the opposite side of the room, girls are busily engaged putting the impregnated bases on to glass moulds, and passing them into a room heated with hot water for drying. A fan is constantly in motion sucking out the air of this room, as otherwise it would speedily become charged with moisture, and so defeat the very object for which the room is designed.

Following the mantles, it is found that, after they are dried, they are passed on to the folders, whose duty it is to straighten them out, and fold them flat in readiness for the "fixing" in an adjoining room. The fixing operation only refers to the top of the mantle. If the reader takes a Welsbach mantle, he will notice the top has a pink ring round it. This represents the process, called the fixing, to which this part of the mantle is subjected before the top is gathered and the asbestos string by which it is suspended is passed through it. In this room, we see 24 girls sitting before an equal number of simple looking machines worked by treadles. One by one the flat limp fabrics are picked up, and the tops are just passed between two little rollers—the operative part of the machine—and out they come with about ¾ inch of their length impregnated by the pink fluid; and the fixing process is completed. Formerly, the dipping was done by hand, and pressure applied by the finger. But this used to affect the operatives' hands. Injury of this kind is now prevented, and the other advantages are that the machines do the work rapidly and perfectly level.

As the mantle proceeds in development, so the number of girls engaged in the successive operations grow until the mantle reaches the toughening operation, when there is a decrease. We have seen the fixing, and next we are introduced to a large, airy room in which at tables ranged down the centre and along the sides sit a hundred girls or so, whose fingers are all busily engaged. To the girls at the side tables, the mantles from the adjoining fixing-room are passed, and on them they stamp the well-known name "A U R." It was incidentally mentioned, by the way, that "Aur" is to give place to "Welsbach" as the distinguishing name to be stamped on the Company's chief productions in the future; and in this the Directors are without question making a wise change. Over to the large bevy of girls at the cross tables, the mantles are transferred; and by them the tops of the mantles are drawn together and the asbestos cord is passed through. The mantles are picked up one at a time, and deftly a girl puts six pleats on either side where the mantle has been fixed, draws the head together (so giving it its cone-shaped top), and then attaches the asbestos cord for its future suspension. After the work has passed the examiner at the end of the room, the mantles are transported by a lift to the burning and seasoning room above.

Let us stay here a moment to emphasize the point as to the amount of individual treatment a mantle has to receive. Until one sees, or is pointedly informed, one cannot realize. Now so far—and the mantle is not nearly ready for boxing—in the actual preparation processes (without taking into account the transmission from room to room) each mantle has been separately handled and treated by seven girls—and there are several more to follow. To this point, we have seen the mantle in the hands of the impregnater, the girl fitting it to the mould for drying, the folder, the fixer, the stamper, the sewer, and the examiner. Besides all these, there are the forewomen in each department constantly supervising; and this—the constant care and observation that are exercised throughout the various processes by those responsible to the chief—is a point that impresses the visitor. All this individual treatment and all this supervision costs money. The mantle we have seen in the hands of seven girls; and it has to

Sewing the Mantle Tops.

be dealt with by at least half-a-dozen others before it is snugly encased, and ready to go out to brighten some room, office, shop, or street. Pick up one of the finished mantles again, look at it, and consider what various processes it passed through even to the stage at which we have arrived in our story of its evolution—from the knitting of the fabric to the lank and indefinitely formed thing as it is seen in the sewing-room of the factory—think of the few pence paid for the mantle, and then ask whether (without committing yourself to any precise figure) there is not a point in price, to secure good work in that delicate article, below which it would be folly to descend. One thing this inspection of the new Welsbach factory proved to the visitor is that the making of a mantle is not an operation that can be done in slapdash style. Care and precision must rule every process.

But our conductor is bidding us follow him. He leads the way outside; and we ascend the iron stairway, and along the iron balcony. As we proceed, it is pointed out that the various operations so far witnessed are all of a simple and safe character; and the new buildings are so planned that all the operations that have any inherent danger—against which every precaution, as already shown, and as will be further disclosed as we proceed, has been taken—are all located on the upper floor. The protection, in fact, is so complete that it is difficult to see how harm can come to any one of the hundreds of girls employed in the finishing processes. Whatever danger there may be in mantle making, careful observation satisfies us that, if mishap there be in a properly ordered factory, it would be accountable to negligence, and negligence alone. It is only the end operations, after the mantle has left the sewing-room, that possess any possibility of danger.

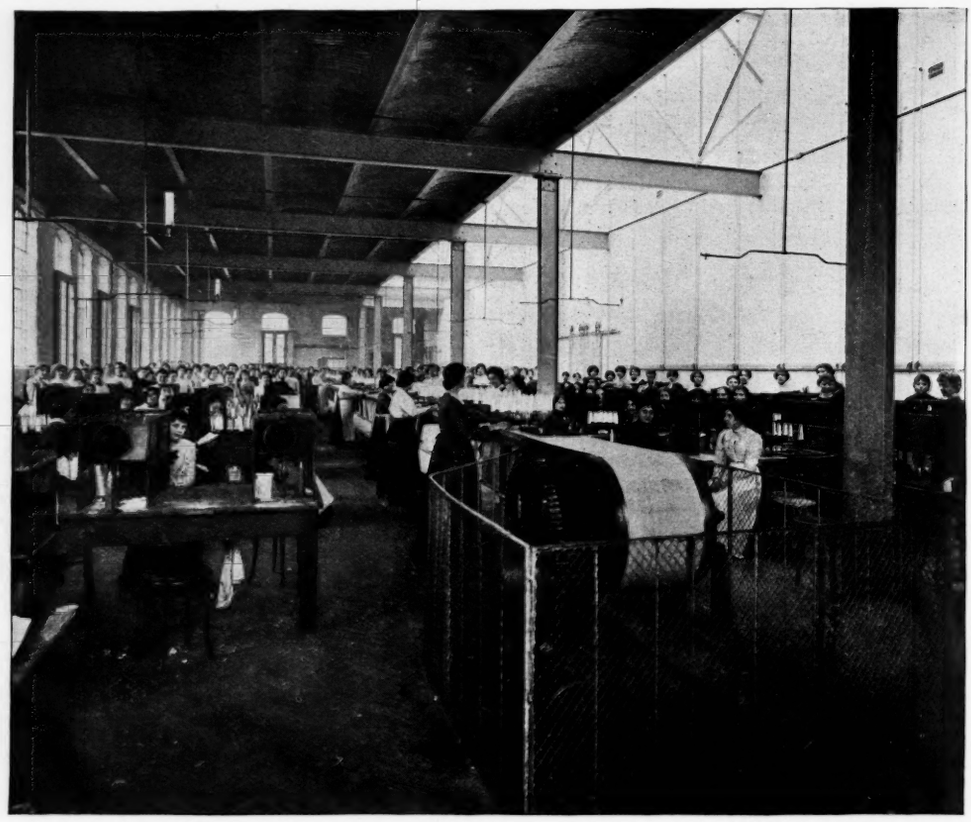
However, we have entered the burning and seasoning room, and are in the midst of a busy scene. The room (a second one equal in size will, a little later, also be in operation) is of considerable dimensions; the length being some 135 feet, and the width 42 feet. Ranged crosswise down the sides of the room, there are numerous tables, at which sat (at the time of the visit) some 240 girls, each with a "seasoning-frame" before her. The room is well lighted by side windows and, for the full length, on the inner side, by part of the roof being glazed. Ample provision is made for natural and mechanical ventilation—the latter by Blackman fans—as the operations conducted here necessitate the best attention in this regard.

Before describing the actual work performed here, let us note a few of the features of the fittings and apparatus essential to the process to which the mantles are subjected. Running the full length of the centre of the room is a belt-conveyor, which saves time by distributing to the girls the requisites for their work, and by carrying from the room the treated mantles. The belt (which is continuously running during working hours) is carried round large revolving drums at each end, and for the full length glides along supporting platforms. These allow the belt to be fairly loosely fitted, and this looseness prevents any jarring of the mantles during their transmission. The motive power is electricity. The upper part of the band carries from the room the seasoned mantles, and the return or lower part of the belt conveys for treatment from the lift to any part of the room the mantles as we saw them in the sewing-room, and also the frames on which seasoned mantles are sent away to the succeeding operation.

In the seasoning, gas is used under a pressure of 5 to 7 lbs. per square inch; and with such a high-pressure supply as this, special provision has been made for its distribution in the room. Under the floor, and easily accessible, is a framework of 4-inch service-pipes, with, in addition to the end pipes, a central cross connection. There is no stoppage of any kind in these pipes; but valves have been inserted for cutting off and controlling any part if necessary. By the plan adopted, the gas has a free circuit; and therefore no dead gas can remain in any portion of the system. On both sides of the tables throughout the room, are the seasoning-frames in which the mantles are separately treated. On this point, it should be mentioned that at the old factory several seasoning-frames have been in use, with each of which the operative can deal simultaneously with ten mantles; but it has its drawbacks and defects, which we need not explain in this sketch. However, there has been a further mechanical development by which additional speed and uniformity of treatment have been attained, and by which—electricity and precise regulation replacing manual operation—any error of personal judgment will be eliminated in the work. It is unnecessary to definitely describe the machines. But a good trial is about to be made of them in the seasoning-room in Block "A;" and, if successful, they will be extensively adopted by the Company.

Returning to the seasoning-frames at which the mantles are treated singly. They are almost square in shape, constructed of iron and glass, and are fitted inside with a bunsen burner, from the centre of which an ordinary jet burns, and also, in a little higher position, with a small ring-burner. The front of the frame is fitted with a black glass, so that the eyes are not affected by the intense light when the mantle is being seasoned by the gas under pressure. Looking through the glass, the worker can see the slightest defect in the mantle. The darkened sight glasses are preferred to spectacles, because the latter throw so much heat directly on to the eyes, and this the glass obviates.

Now let us follow the process through which one of the girls puts a mantle as it has come to her from the sewing-room where last we saw it. Having shaped it over a wooden model, she picks it up by a bent wire, and sets fire to it at the elevated ring-burner. During this process, the whole of the cotton is abstracted, and the mantle shrinks to about half the length that it was previously. Then, turning the tap of the bunsen burner to which the high-pressure gas is supplied, and which is ignited by the central



Burning and Seasoning the Mantles—View showing Belt Conveyor down Centre of Room.

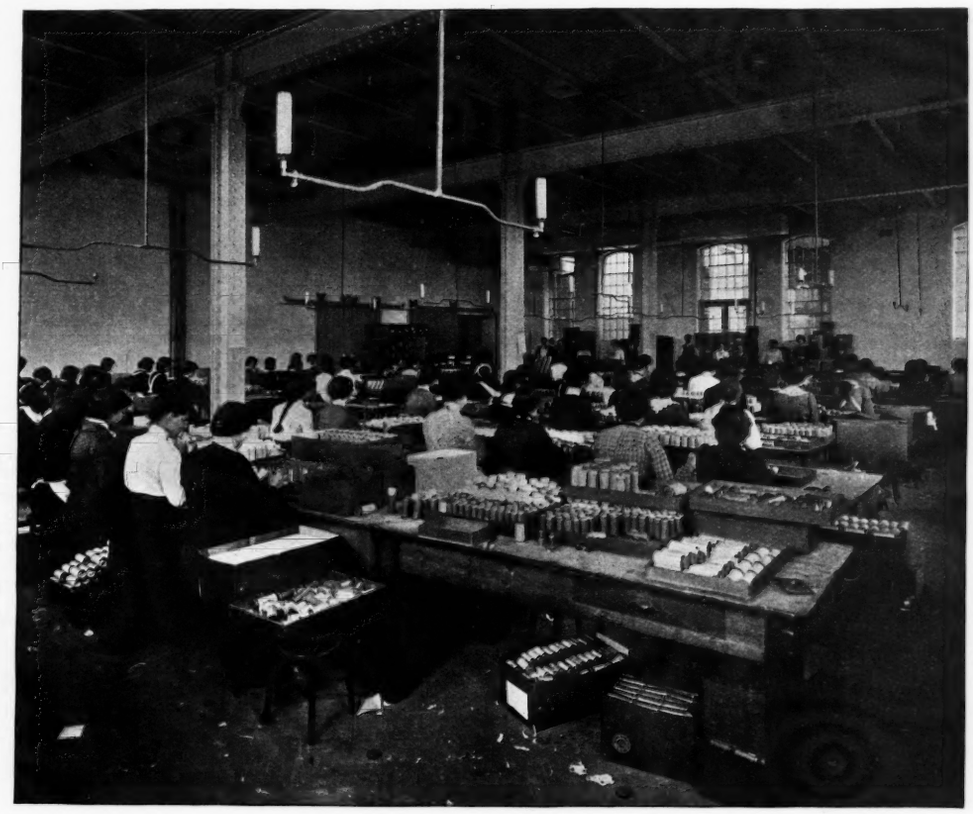
burning jet, she seasons the mantle by its intense flame—in other words, she anneals or hardens it; and in this process, it again shrinks to about half its size. Now take the mantle as purchased, and multiply its length by four, and you have the length of the material which originally formed the base of the mantle before it underwent treatment at the hands of the seasoning girl. The wires from the hooked top of which the mantles hang are stood in a thirty-holed tin frame, and when this is full the girl places it on the belt-conveyor, and it passes along to the next room in which the toughening of the mantles is performed. To reach the toughening-room we pass over a covered-in bridge, 18 feet long, which connects Blocks "A" and "B."

In the state in which we have just seen the mantles travelling along the conveyor, it would be impossible to transport them to the users; and hence the toughening, which converts them as it were into the solid tube as they are seen by the purchaser. In the toughening-room about two dozen girls were found at work. The place is fitted with benches, in front of which are baths containing the toughening mixture of collodion, ether, and alcohol. Into this the girls dip the mantles six to ten at a time. They are then re-placed on their stands, and these are passed into little side chambers, with sliding glass doors, in the farther partition wall; and from these chambers they are taken through a sliding door on the other side, where is situated the drying-room. To the stranger this method of passing the mantles from the one department to the other would perhaps seem a cumbrous and unnecessary one; but, as a matter of fact, it is absolutely necessary in order to prevent the hot air (which is charged with the vapour given off by the toughening fluid) passing from the drying-room. But before leaving the toughening-room, we note a point of interest. It is this, that the room is ventilated downwards, through ample openings between the tables. The reason for this downward method of ventilation is that the vapour given off during the toughening treatment is heavier than the air. It is sucked down into ventilating-shafts, and blown out into the open air, by means of sirocco fans; a fresh supply of air being constantly admitted at the top of the room.

Proceeding, we pass into the drying-room; and the visitor who prefers a temperature nearer 60° Fahr. than 120° Fahr. (which is the approximate temperature at which the room is maintained) does not desire to linger in the apartment. But we may stay a minute or two to examine the place. It is seen that there is nothing in the room to burn; for the very good reason that this is the room of all the rooms that is most susceptible to fire, and therefore every precaution is taken to avoid such a contingency. The room is strongly constructed within a larger room; and all the racks and fittings in it are made of iron and wire gauze. From the little chambers in the walls, to which reference was made in describing the operations in the last room, the girl attendants lift the stands bearing the mantles that have been treated by the toughening fluid, and place them on the racks, underneath which are hot-water coils for raising and maintaining the temperature at about the point already mentioned. Of course, the evaporation that takes place causes the air of the room to be highly charged with ether and alcohol vapour; and the humid and dangerous air is removed mechanically. The room is lighted by plate glass windows in the top and sides; and, when artificial light is required, it is obtained from incandescent lights fixed outside the windows. Electric light generated on the premises is also to be introduced—not on account of its lighting power, but as a stand-by and additional safeguard under the circumstances peculiar to this particular part of the mantle-making process. The electric lights will be shielded by double globes of extra thick glass, so that they cannot be easily broken. It is really an unkind fate that gives the rival a useful duty in the birthplace of the incandescent gas mantle.

It is gratifying to find the attendants are not called upon to remain many minutes at a time in this highly heated room. They are, in fact, only required to enter it occasionally for the transference of the mantles to the racks, or from them to the succeeding room, which is a lofty and spacious apartment, and in which the first stage of the final work takes place. It is here that the mantles are put for protection into cylindrical cases, with their rough bottom edges exposed; and in doing this the girls throw on one side the defective ones. The empty frames on which the mantles have been passing from the seasoning-room are from here taken back on trolleys to that busy place, and distributed down the room on the return portion of the belt-conveyor. At first, it seems strange that such a large room should be devoted exclusively to such a simple operation as the first casing of the mantles as described; but experience has proved that good work and economy are derived in the production of mantles—which production involves so many processes—by confining to each operation its own room, and giving to it its own staff.

To follow the mantles to their final stage, we have again to pass to the outside of the building, and descend one of the iron stairways. In doing this, an outside lift is pointed out, which is to be worked by compressed air, and by which the collodion mixture is raised to the toughening-room. Small things like this (as well as the more imposing one) testify to the completeness of the foresight that has been exercised in ensuring the safety of the premises and the operatives. With this explanation, we have reached the commodious trimming and packing room on the ground floor. Here about sixty girls are employed. Some, with an adroitness cultivated by considerable practice, are trimming the bottoms of the mantles with scissors, and testing them over (unlighted) burners for size and shape before they are finally packed; and others—the packers—are threading the loose string through the tops of the mantles (by which they are lifted), putting them finally into their cases, and lidding them. Now look at the



Trimming and Packing the Finished Mantles.

lid of the box in which is contained the Welsbach mantle which you have examined before during this sketch, and there will be seen a number stamped. That number belongs to the girl who packed your mantle. For distribution from the factory, the mantles, in their cylindrical cases, are packed in "outers" by the dozen; and these are placed in boxes holding three or four gross. Altogether, the Company make nearly thirty varieties of mantles —different in kind or size.

We have come to the end of the production of the mantle; and who but the initiated would dream, on looking at the finished article, that it has passed through the dozen and more different operations, as we have traced them here, before arriving at perfection, and that it has claimed so much discretion, care, and attention. Although it does not exact from the user so much in its subsequent use, its best and longest service is secured by continuance of the considerate treatment and by fair conditions.

Before concluding this article, there are a few other interesting features about the new factory which, subscribing to the operations described, and adding to the comfort and well-being of the employees, may be mentioned in order to show the completeness of this new centre of industry. In the basements are several things especially interesting to the engineer. In passing through the box and case store room, which forms part of the basement of Block "B," along the ceilings are noticed the large ducts in connection with the mechanical ventilating system. In the adjoining store there is accommodation for 3 or 4 million raw cottons. Crossing over to the basement in Block "A," we come to the engine-room; and here an interesting collection of machinery is found. Foremost to attract attention of one interested in gas is a 32-horse power Crossley engine of the latest type, coupled up to a dynamo. This plant will suffice for the electrical driving of the fans and machinery, and the lighting of the toughening-room. There is also seen one of the Tilghman Sand Blast Company's double-acting compressors, which compress up to 7 lbs. the whole of the gas used in the seasoning operation. The compressed gas is fed into two small holders; and these, with the 4-inch mains running to and under the floor of the seasoning-room, make a good reserve. In another section of the basement, are four furnaces—two of which supply the hot water for the drying-rooms, and two the hot-water circulating system for the heating of the factory. Close by, we come across some well-fitted workshops for the mechanics, a store for fittings of various kinds, and a meter-room containing three meters—one a 500-light for the high-pressure gas for seasoning, and the other two (100-light) for the supply of the dining-rooms and the factory lights.

There is a third building that we have not yet referred to, and that is known as Block "C." Here we find further pleasing evidence of the consideration the Company have given to the question of the comfort of the hundreds of girls they employ, by furnishing them with well-equipped kitchens, in which they can have their meal prepared or home-provided meals warmed, and with comfortable dining-halls—89 ft. by 35 ft.—for the meals. Looking into these rooms during the dinner hour, it was a merry scene that met the view, and contentment with the new surroundings was manifest. Next to the safeguards from injury and disaster, and the skilful planning of the establishment for the economical production of mantles, there is nothing that pleased the writer during the visit more than the perfect arrangements made to ensure the comfort and happiness of the employees—not only in respect of the conveniences for the obtaining of hot and wholesome meals, but in the healthy conditions in which work will in future be carried on —all brought to pass by foresight and prudence. In the same block are the laboratories and photometer-room, all of which are being fitted not lavishly, but with an eye to good practical work being conducted in them. An inspection of the light and well-ordered offices ended a visit, which had been both interesting and instructive.

A word of congratulation to the Directors and officers of the Company on their new possession may fitly conclude this article. In design, construction, and equipment, the whole factory is founded on the experience gained in the past of the requirements of the special line of work; and we sincerely hope the future has in store an abundant prosperity for the new venture.

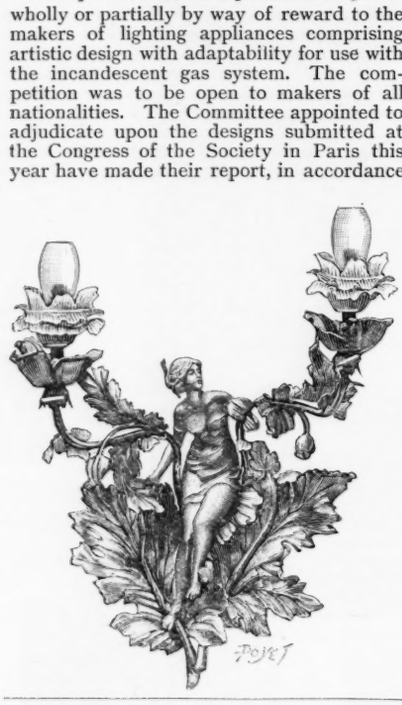
The Proposed Junior Gas Association for London.—Referring to the proposal emanating from past and present students in the "Gas Manufacture" class at the Regent Street Polytechnic, to form a Junior Gas Association for London, which was noticed in our editorial columns last week, we are asked by Mr. P. F. Scarth to notify that a meeting of intending members of the Association will be held at that institution on Monday evening next, at seven o'clock. We trust that there will be a good attendance, and that the result may be the enrolment of an adequate number of members to allow of the project being carried to a successful issue.

The Calorific Power of Coal and Oil.—In a recent number of the "Comptus Rendus," M. Goutal endeavoured to establish, by the process of calcination, incineration, and desiccation, a relation between the calorific power of coal and that of combustibles which are commonly used, in order to determine the fixed carbon, the volatile materials, the ash, and the humidity. His experiments show that the calorific power of pure anthracite has the mean value of 8250 calories, and that of anthracite oils 8550 calories. A maximum of 8700 calories is attained for coal where the volatile matter is from 10 to 30 per cent. of the whole. The calorific power of oils increases in proportion as their volatile matter decreases, up to the limiting value of 30 per cent., after which the calorific power of natural combustible materials and that of their volatile matter diminishes concurrently.

FRENCH ARTISTIC LIGHTING APPLIANCES.

Premiated Designs in the Competition of the Société Technique du Gaz en France.

Our readers may remember that at the International Gas Congress in Paris two years ago the Committee of the Société Technique established a premium of 5000 frs., to be distributed wholly or partially by way of reward to the makers of lighting appliances comprising artistic design with adaptability for use with the incandescent gas system. The competition was to be open to makers of all nationalities. The Committee appointed to adjudicate upon the designs submitted at the Congress of the Society in Paris this year have made their report, in accordance with which the Committee of the Society have awarded a premium of 500 frs. to MM. Boulanger et Roux, of Paris, for the appliances shown in the accompanying illustrations, which do not need any description—the designs speaking for themselves. The lamp in the centre, which is made in bronze, with marble pedestal and silk shade, is constructed for an incandescent burner, and is suitable for the lighting of a writing-table. The brackets on either side are arranged for "B" incandescent burners, which, it will be seen, are surrounded by globes fitted in the corollas of poppies.



A TIME GAS-SUPPLY CONTROLLING APPARATUS.

Slot arrangements of many kinds and for many purposes—which secure prepayment for something to be supplied—have become a standing institution in the country. In most cases, they displace labour at one end and create employment at the other. Even in the case of the popular, and still advancing prepayment gas-meter, it does away with the making out, distribution, and receipting of accounts, but it creates work for collectors and the keeping of an increased number of book accounts in the office. Mr. H. Cooney, of the Liverpool and London Gas-Meter Company, is the inventor of a little prepayment gas-supply controlling apparatus, which entails no labour, will in itself complete a little business transaction without troubling anyone but the buyer, and will confer a convenience and comfort by the simple expedient of placing a coin in a slot and giving a lever a half turn to set the mechanism—without asking anyone's permission or requiring, as just hinted, anyone's service. Those who travel from home in the winter months, and have to stay at hotels, will in one direction appreciate Mr. Cooney's invention more than those whose business involves no interference with the comforts of home at night time; and it is the traveller who will see in the small and ingenious attachment which we are going to describe a large field of application and usefulness.

If recollection serves us right, there have been more than one inventor who has turned his attention to the devising of means whereby a traveller staying at an hotel can have the comfort of a gas-fire. Ordinary prepayment meters of a small type have been proposed, but there are obvious objections to them; and time appliances have been brought out, which involved the winding and setting of a clock by an employee of the establishment, and prepayment at the office or a charge in the guest's account. This drawback and other shortcomings have stood in the way of general adoption. However, Mr. Cooney seems to have—in fact, we feel safe in saying "has"—surmounted the difficulties by his little device to which, for the want of a better descriptive word, he has given the name "Timeometer," signifying that it admits of the consumption of gas for a stated time, and does not measure the amount consumed. The trouble of having a coal fire made, the purposely prohibitive price frequently charged, and one's disinclination to give strange servants additional work to do of which they do not in many cases hide their disapproval, deter the traveller in the winter from obtaining the comfort and warmth in his bedroom which he desires, and which desire usually becomes stronger when it cannot be easily gratified. Now with a little appliance which is reliable in action—and we believe in the present arrangement we have such an appliance—and which will require of the employees of an hotel but the infinitesimal amount of additional work occasioned by the emptying of the cash-boxes and the booking of the proceeds, there is removed the only obstacle to the installation of gas-fires throughout the bedrooms; and those hotel-keepers who take advantage of the invention will without doubt find that they have in it in the winter months a source of attraction, and consequently income (not only from the gas consumed, but from the patronage of the house), that will not be possessed by those who refuse to meet the needs of their customers in this respect. It is obvious, too, that it will be to the benefit of gas suppliers to encourage the adoption of the invention.

Now this time gas-supply controlling apparatus is all comprised within a case (which can be made in any style to suit its situation), measuring 7 in. by 3½ in. by 3 in.; so that there is nothing unsightly about it. It is merely inserted in, and forms part of, the service-pipe to the fire. It can be made for any coin; and to pass gas for any length of time determined upon. All that has to be done by the user is to insert his coin in the slot, and turn the actuating handle or lever (shown in the illustration) from "on" to "off," which action permits the coin to drop into the locked receiving-box below. This operation (without any winding) sets the clockwork mechanism for a supply of gas; and upon turning the lever back to "on," the gas can be used continuously or intermittently, until the time-limit for the use of the gas has been exhausted. That is to say, supposing the apparatus is one which permits of the use of a fire for two hours for sixpence—by the one coin the fire can be alight for (say) an hour before retiring, and the unexpired time will remain to the credit of the user for the morning. It only requires the reversing of the lever to stop the clock and close the valve. There is no necessity to describe the mechanism in detail, seeing that only as recently as June 3 an

The "Timeometer."

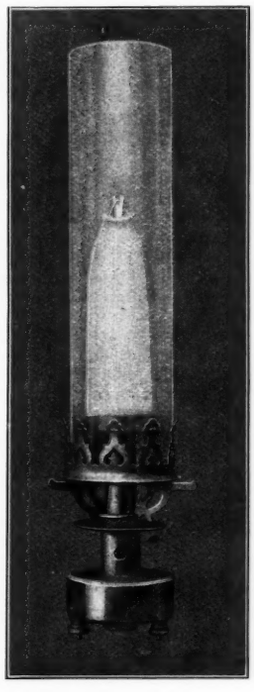
abstract of the patent specification of the invention appeared in the "JOURNAL." But it may be explained that the spindle carrying the coin is locked to a wheel; and in this wheel there are a number of teeth cut. The wheel makes one complete revolution for every coin. But there is a certain section of it with the teeth entirely cut away; and when this comes into gear with the lower wheel with which it engages, it allows the spring (which had been wound up by the insertion of the coin) to expand, and tightly shut the gas-valve. The movement and closure is instantaneous, so that there is no chance of danger as there would be with a gradual closing of the valve. Before the whole of the gas is consumed, the lever cannot be turned half on or half off; the slightest movement one way or the other completely opens or closes the valve. No matter what test is applied to the appliance, it is found absolutely impossible, when the valve is once closed, to get the slightest trace of gas through it. Of this we have been convinced.

Among other points which may be mentioned are these: A second coin cannot be inserted while part of the gas paid for remains unconsumed; the coin slot being securely barred. For hotel purposes, it is also proposed to fit the coin receiving-box with a glass front, so that it will not be necessary for the coins to be collected until the chambermaid reports the box to be full. A bye-pass, too (if desired), can be very easily adapted to the fire. Furthermore, the utility of the apparatus is not confined to the purpose to which attention has been chiefly directed here. It can be applied to the lighting of bedrooms in hotels, boarding-houses, and large business establishments, and discs used in substitution for an ordinary coin. The surreptitious and wasteful burning of gas is a constant complaint and ground of annoyance in such places. In the same way, it can be applied to the checking of careless waste, which is a common trouble, in the use of cooking-stoves. The average time a cooking-stove is used for a small family would not exceed (say) two hours a day. The insertion of a disc, and the passing of it into the coin-box would allow the stove to be used for the two hours; but that period of time could be extended over the whole day, or longer if required—precisely in the same way as was explained in the case of the gas-fire. The windows of shops, too, can with this attachment remain illuminated for a fixed time after the closing hour. In like manner, it would also be applicable to street-lamps—extinguishing them, without the visit of a lamplighter, at any predetermined time in the morning. In electric lighting and heating by electric radiators, the attachment can be applied equally well, by a little structural alteration. In this case, the insertion of a coin makes the contact, and, at the end of two hours or other time for which the apparatus is set, the current is broken. In fact, the limit to its scope of usefulness has yet to be ascertained. The mechanism is strongly made; and a further inducement to try it will be its cheapness.

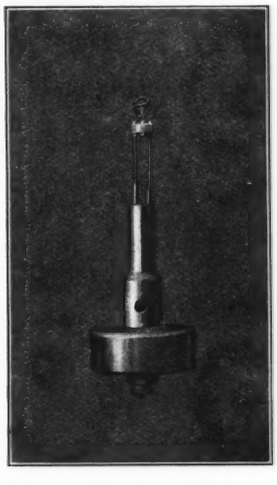
NEW ELECTRICAL GAS IGNITION AND EXTINGUISHING DEVICE.

ELECTRICAL ignition and extinguishing devices for gas-burners have not been taken kindly to in this country; but there is no reason why a reliable device should not earn for itself favour, as there is—especially in large installations of incandescent gas-lights, and for lights that have to be placed in positions not readily accessible in the lighting of extensive interiors—a good opening for one. The want of success hitherto has been, we believe, in the main due to the deficiency in the essential of trustworthiness, and the constant attention required to keep the electrical attachments up to a serviceable mark. But disappointment has only been an incentive to effort to overcome difficulties, and to reach the security of a reputation for good behaviour; and now to-day, we learn, the application of such contrivances in the gas-lighted hotels and public buildings of the principal cities of Germany is becoming quite general. One form of these arrangements—and study of the working of the different types by English electricians pronounce this to be the best—has been purchased for development in this country by the Telephos Automatic Gas-Lighter Syndicate, of Mildmay Chambers, Union Court, E.C. In its construction, it follows somewhat on the lines of previous introductions in this country; but it goes a step farther, and is backed, on the point of reliability, by a period of usage in many Continental installations. The illustrations show the outward form of the appliance; and, in addition to what is there seen, is a simple operating system of cells, thin covered wires, and push-buttons—very much after the style of fittings connected with an electric bell system. By its use, gas-lights can be ignited or extinguished singly or in groups from various centres, situated at any distance from the lamps. Convenience of manipulation is an attribute of the incandescent electric light that is constantly held up as a point in its favour in comparison with other methods of lighting; and therefore a device of this kind should receive consideration as a useful weapon with which to counteract the advantage which the rival has undoubtedly possessed, and which has been a considerable commending feature when the merits of the systems of lighting have been put into the scale.

The small drum is the only part of the main fitting which is exposed to view in connection with the burners. It is situated just below the air-admission holes of the burner, and contains the whole of the operating parts. Without going into particulars as to the electrical mechanism, a sufficient description will be that centrally in the base of the drum is a switch or ratchet-wheel, provided with concentric perforations, corresponding with perforations in the support or stand on the floor of the drum, in exact relation with the number of teeth on the ratchet-wheel. It is by means of these perforations that the gas supply is admitted to the drum and to the burner above, and by the closing of the perforations that the gas supply is shut off. Take, as a simple example, before going any further, one of these arrangements fitted to a single burner. Pressing the push-button causes the passing of the electric current to the operating mechanism, the ratchet-wheel is moved forward one tooth, and this turns the perforated wheel so that there is a free passage for the gas through the corresponding holes in the base. Press the button again, and the switch-wheel is once more moved a tooth forward, and the perforations are carried over the unperforated intervals in the seat of the wheel below, and thus, the passage of the gas being sealed, the light is extinguished. The igniting portion of the device is passed through the stem of the burner, and ends in a platinum thread, just above the burner top and in the interior of the mantle. Simultaneously with the opening of the gas-supply passages, the electric current heats up the platinum thread head, and causes the ignition of the gas. Or, on the other hand, if preferred, the device can be confined to the opening and closing of the gas-admission ways, and the ignition be accomplished by means of an ordinary bye-pass jet. The first method, however, is favoured, because the electrical ignition is much less liable to occasion trouble, and is certainly more economical.



Now it will be seen from this that the arrangement lends itself to a considerable number of variations. From one centre—or push-button—a considerable group of lights can be manipulated; these again by simple variations in the positions and number of the perforations in the switch-wheels in the drums can also be varied, as will be explained; or, again, one lighting system can be controlled, by several push-buttons located in convenient situations. The variations in the lighting of a group of burners in a room or on a chandelier is accomplished, as said, entirely by the number and positions of the perforations in the switch-wheel; and, therefore, according to the possible requirements, so are the devices supplied with differently perforated wheels. We need only give one illustration, as the reader will readily appreciate from it how the variation over any number of lights can be effected. Take a group of three burners which will only be used one, two, or the three at a time according to requirements. The blanks and perforations near the periphery of the switch-wheel would be thus: Burner A, o o o —; B, — o o —; C, — — o —. All three are standing at blank. The button is pushed, and it turns the three switch-wheels one tooth, but only opens the gas-way in A; the wheels of B and C being left blank. The second push turns the wheels again; and this gives two gas-passages (A and B) open. The third push opens all three; and the fourth puts the lights out by the wheels being again turned to blank. Thus quite a number of useful groupings of burners in a room or on a chandelier can be made.



It is unnecessary, so far as readers of the "JOURNAL" are concerned, to dilate on the convenience of being able, by merely pushing a button, to light up a room or building without matches, torches, or other cumbrous means; and of the usefulness of such a system in all positions and places, and under almost all circumstances. At the offices of the Syndicate, we have seen the use of the appliance demonstrated for single lights, for groups which can be lit up singly or in numbers as occasion demands, and for the ignition of lights at a distance in the corridor—all from the same push

button in the office, and on no occasion was there a lapse in duty. The thin silk-covered wires are almost invisible, and do not by any means show up offensively on the chandelier. There are other directions, too, in which this system of electrical ignition and extinguishing can be usefully employed, and give to incandescent gas lighting employment in a field that has been held by electric lighting. That is, in the so-called "flash-light" method of advertising which is becoming common in large cities at night time, and for changing coloured light attractions in shop windows. United to clockwork mechanism, the system of ignition and extinguishing can be made to do in advertising exactly what is now done by electricity—and far cheaper both from the installation and working cost points of view. The lighting and extinguishing of gas-fires and series of street-lamps also come within the range of the system's application.

OBITUARY.

Mr. W. B. Wilkinson, who died last week, was for some years Chairman of the Newcastle and Gateshead Gas Company; being succeeded in this office by Mr. Adamson, and subsequently by Sir W. H. Stephenson. The deceased was in his 84th year.

The death took place on the 13th inst., at his residence in Hyde Park Gardens, of Mr. Peter Brotherhood, M.Inst.C.E., a well-known engineer, to whom the world is indebted for the first practical application of the single-acting principle to high-speed engines. He originally carried on business, in association with Mr. Kittoe, in Compton Street, Goswell Road; and his name will be remembered by some of our readers in connection with the "Paragon" steam-pump. He was in his 65th year.

PERSONAL.

At a smoking concert on the 9th inst., the employees of the Goole Gas and Water Works testified their esteem for Mr. Matt. Dunn, who has relinquished the management to take the position of Assistant-Manager at Stockton, by presenting him with an illuminated address and a black marble timepiece. The presentation was made by Mr. A. Blyth, Chairman of the District Council, who presided, and who complimented the drafter of the address upon the admirable manner in which he had expressed the feeling which should exist in all works, whether public or private. With regard to Mr. Dunn, he said that during the whole time he had been at Goole there had not been the slightest show of slackness on his part in the discharge of his duties. He had always manifested a desire to bring everything up to date; and in this he had had the cordial and continued support of the Council. They were most fortunate in the appointment of Mr. Dunn, whose departure would be a distinct loss to the town. These eulogistic remarks having been endorsed by other speakers, Mr. Dunn acknowledged the gifts. He reviewed his work in Goole, and concluded by assuring the donors of the two handsome presents he had received that he should never look upon them without thinking of the happy associations he had had with the workmen. It may be mentioned that Mr. Dunn's successor is Mr. T. E. Franklin, recently assistant to Mr. Isaac Carr at Widnes.

NOTES.

Some Points of the German Iron Industry.

Reporting upon the progress of the German iron industry since 1880, Mr. W. Brügmann mentions the allied coking industry as having been improved and enlarged with it. The desire of the iron manufacturers is for a coke with as little ash as possible, with the maximum of physical strength. Smallness of ash content is a question of washing the coal; and although a very pure coke can be obtained in this way, the waste of coal is considerable. Since the strength of the coke is a much more important matter than freedom from ash, the latter is allowed to remain at 8 or 9 per cent. To strengthen the coke, makers add a proportion of splint coal to the regular coking coal, the mixing being done by machines to ensure uniformity. The coal charges are also compressed in boxes in which the coking is done, especially in the Upper Silesian district. The most important agent in the production of hard coke is a highly heated oven. In the Coppée oven, which is almost universally used in Germany, the hot working is achieved by making the coking chambers narrow and not too high. The Otto method of bottom firing was a very considerable improvement on this plan. By the waste heat of gasification, something like 1·2 lbs. of water can be evaporated per pound of coal coked. The quantities of tar and ammonia recovered from the German coke-ovens are about 294,000 tons of the former and 84,000 tons of the latter as sulphate annually. These figures represent $3\frac{1}{2}$ per cent. of tar and 1 per cent. of ammonia for the dry weight of coal carbonized. Twenty years ago, Germany imported 80,000 tons of sulphate of ammonia; whereas the importation is not now more than 30,000 tons yearly. Rapid progress is being made in the application of gas-engines to use in power generation the waste gases of the blast-furnaces. It is claimed that these motors are economical when running at full power; but they are less so at lighter loads. The power absorbed in washing the gas is also not inconsiderable, and reduces the net available supply of power by an appreciable amount. As regards prime cost, a blast-furnace gas-engine with gas-washing plant costs about the same as a steam-engine with a battery of boilers. The economy comes after.

Bricklaying Records at the Westinghouse Works.

The subject of the tale of bricks laid per day by the bricklayers employed on the Westinghouse buildings at Trafford Park, near Manchester, has acquired world-wide interest. The true story of how this work was accomplished by English bricklayers under American direction, has been told by Mr. W. G. Sloan, one of the engineering staff employed on the construction, in a paper contributed to an American society. It is stated that the works were planned by Mr. Thomas Rodd, of Pittsburg, and their execution was entrusted in the first place to a Manchester architect. Under his supervision, progress was so slow that another arrangement had to be made to shorten the period of five years which the building threatened to occupy. The firm of Messrs. James Stewart and Co., of St. Louis and Pittsburg, were called in, and they undertook to complete the work in fifteen months. Therefore a year ago last March, Mr. J. C. Stewart, with six engineers and foremen, sailed for England, and on arrival immediately took charge of the job. The organization of the work commenced with a reformation of the supervising staff, who were found to be too slack and scattered. About half of them sought employment elsewhere. The removal of slack methods among the men followed the reorganizing of the clerk of the works' staff. Nothing revolutionary seems to have been attempted, only dilatory practices and traditions were stamped out. By securing the best bricklayers, and paying somewhat more than the Union rate of wages, the number of bricks laid per day was gradually and greatly increased. Shortly after the new administration took hold of the job, the statement was made publicly that the Trafford Park bricklayers were laying more than 900 bricks per man per day. Later on, as the organization improved, and the men became accustomed to the new methods, this average was doubled on the same class of work. This caused so much comment that it was thought advisable to have the facts verified; and on the construction of the large brick stack, the foremen made affidavits as to the number of bricks laid per man per day. The average was more than 1900; the best day's work being 2100 bricks per man. The explanation is that it is not the workmen who are at fault, but slackness at headquarters is to be suspected, where British work is slow and unnecessarily costly.

Gas Companies' Protection Association.—We learn from a notice issued by the Secretary of the Association (Mr. F. E. Cooper) that the fifth annual general meeting will be held at the Westminster Palace Hotel on Thursday, the 30th inst. The business will include the reception of the report and accounts and the election of six gentlemen to serve on the Committee in place of those retiring and of the late Mr. Charles Sellers. The retiring members are Sir George Livesey (Chairman of the Committee) and Messrs. W. Hart, H. E. Jones, W. King, and W. R. Phillips, who offer themselves for re-election.

West's Compressed-Air Stoking Machinery for the Continent.—The Municipality of Crefeld have decided to introduce stoking machinery into their gas-works as a result of a tour of inspection made some months ago by their Engineer (Mr. Salzenberg) through a number of gas-works in England and on the Continent. As the outcome of this visit, he has recommended them to instal West's compressed-air machinery; and this system is to be introduced, and is to operate in a retort-house 420 feet long, containing 288 retorts. One charging and one drawing machine will be capable of working the whole of the retorts. In conjunction with the stoking machinery, coal and coke-handling appliances are being introduced, so that the retort-house will be equipped with automatic appliances throughout.

No Improvement in Mantles during the Past Twelve Months.—The report of the Photometric Committee of the German Association of Gas and Water Engineers for the year 1901-02 states that during the past year incandescent gas mantles have advanced but little in respect of increased lighting power, and that many kinds, owing to endeavours to obtain a high lighting power by the use of thin cotton, have declined considerably in durability. The report further says that, as the work of the International Photometric Committee has been at a standstill, it has been resolved to proceed with researches without regard to that Committee. Detailed experiments are to be made, at the instance of the German Association, on the lighting power of various descriptions of mantles when using gas of low illuminating power, and with mixtures consisting of coal gas and oil-carburetted or benzol-carburetted water gas. An apparatus for the shaping of mantles according to Buhlmann's system is to be procured by the Association for use in connection with the tests on the illuminating power of mantles. The report was signed by Herr Thomas, the Manager of the Zittau Gas-Works.

COMMUNICATED ARTICLE.

GRID-VALVES.

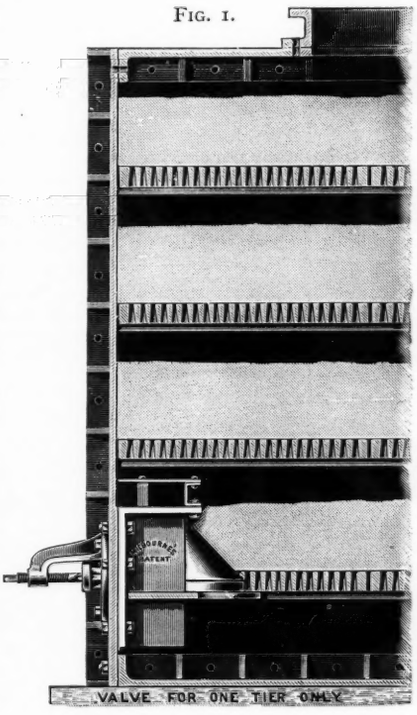
By R. J. Milbourne, Assoc.M.Inst.C.E.

In an article entitled "The 'Milbourne' and 'Prins van Doesburgh' Systems of Purifiers," which appeared in the "Journal" for the 23rd ult., reference was made to the statement of Heer C. T. Salomons, reported in a recent number of "Het Gas," that he finds great similarity between the Milbourne gas-purifier valve described in the "Register of Patents" in the "Journal" for March 18 last (p. 705) and those invented by Heer Prins van Doesburgh. Heer Salomons is quite correct. There is a decided similarity between the Milbourne grid-valve, and the valve devised by Heer Prins van Doesburgh. But as the Milbourne complete English patent was accepted in June, 1901, and that of Heer Prins van Doesburgh only dates from October of the same year, the priority of claim is clearly with the writer in this instance.

It should be stated, however, that neither the writer nor Heer Prins van Doesburgh can claim to be the pioneers of this invention; and to place on record the history of the grid-valve it is necessary to mention that the first Engineer known to the writer to introduce such an appliance to the gas world was Mr. F. S. Cripps, whose invention was patented in 1897. In his particular form of valve, the faces are never exposed to the action of the gas, no matter whether the valve is open or shut.

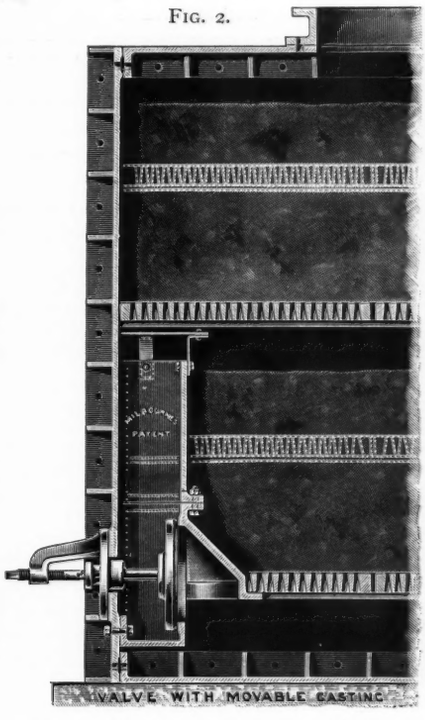
Leaving aside the question of priority, generally speaking the Milbourne or Cripps grid-valve accomplishes all that the Van Doesburgh does, or at any rate all that is required in purifying. If we read the patent specification of the Milbourne valve, we find: "The object of the invention is to provide gas-purifiers with a valvular arrangement which can be operated to enable any tier or tiers of purifying material to be bye-passed." This object is generally considered sufficient for usual purifying working. The VanDoesburgh system professes to go further. It is said to secure (1) an enlarged purifying surface on a limited ground area; (2) complete fouling or exhaustion of the oxide in the purifying vessels; (3) that every tier in a vessel shall become in turn No. 1; and (4) that it shall never be necessary to empty the vessels on account of their resistance becoming too high. Briefly, it is said to give an almost perfect fouling of the oxide, and to effect a saving in cost of construction and wages.

Fig. 1.



VALVE FOR ONE TIER ONLY.

Fig. 2.



VALVE WITH MOVABLE CASTING.

It may be questioned whether experience will prove that all these claims can be substantiated. It may also be questioned whether all these attributes are necessary, even if substantiated. To repeat the proverb made use of by Heer Salomons: "Every alteration is not necessarily an improvement," and it appears that the Prins van Doesburgh system is merely an alteration of the writer's system, or, more correctly speaking, an attenuation of the same. To come to practical politics. Do English engineers ever experience any serious inconvenience from excessive back-pressure, which could not be fully provided for by having a grid-valve fixed to the lowest or first tier of sieves, or at the utmost the first and second tiers? Is it not a fact that in the majority of English gas-works, each purifier can be completely fouled and exhausted (necessitating its being thrown out of action and recharged) long before the resistance becomes too high?

In British practice, it is generally found (whenever trouble is experienced) that the lower tier of purifying material cakes hard, and causes a back-pressure. Therefore, the chief and primary object of a grid-valve is to relieve the back-pressure on the lowest tier of sieves; for by the use of the grid-valve this lower tier can be bye-passed, and then the remaining three tiers worked until they are spent and fouled. With Heer Salomons' statement, that the improvement in working should not be obtained at the expense of good purification of gas, one must be in entire agreement. The purification of gas should have first consideration. This is so in most British gas-works, at all events—especially those which have the sulphur clauses to contend with. For this very reason it would not be judicious to recommend the adoption of a grid-valve to bye-pass more than the first or lowest tier of sieves; for whenever the second or third tier is discovered to be giving excessive back-pressure, it will invariably be found more economical to throw the purifier out of action and have it recharged.

Possibly Herr Salomon has formed an erroneous opinion as to the writer's grid-valve, and the extent of its use, from merely perusing the description given in the "Register of Patents," in which it is stated that "any tier or tiers can be bye-passed," which, of course, is inserted in the specification to secure full protection and patent rights for the invention. Heer Salomons' second objection is an expression of doubt as to whether the plan of fixing valves inside purifying vessels is to be commended, as the valve surfaces are in constant contact with unpurified gas.

In the first place, the question of fixing valves inside purifying vessels has long since passed beyond either the theoretical or experimental stage; but when we consider that valve-faces are exposed to unpurified gas at the hydraulic mains, condensers, exhausters, washers, and scrubbers, where the percentage of impure gas is greater than it is at the purifiers, it would seem to be mere quibbling to raise such an objection. Valves which are affected by being in contact with unpurified gas should not be used in any gas-works, small or large; for it is difficult to imagine conditions in a gas-works where the majority of valves are not continually in contact with unpurified gas.

From these remarks, it will no doubt be seen that, although the Heer Prins van Doesburgh grid-valve is similar to the Milbourne valve, yet he (Heer van Doesburgh) claims a much more extended field of application for his valve than does the writer, who, however, contends that these further applications are uncalled for, and therefore superfluous—so far as British practice goes, at all events.

To those readers of the "Journal" who have read the Van Doesburgh article, the accompanying illustrations of the Milbourne grid-valve may not be out of place.

In fig. 1, the valve is shown applied to purifiers working with four tiers of lime, and in fig. 2 the valve is shown applied to an oxide purifier containing two tiers of material, and exhibits clearly the use and extent to which the grid or relief valve is employed in gas-works in Great Britain. It is advisable that this valve should be fitted to each purifier, inasmuch as each box becomes in turn the first or foul purifier; and it is in the lowest tier of grids in the first purifier that the purifying material often becomes so sodden, compact, and hard, that it resists the passage of gas, and this causes excessive back-pressure. The first tier of grids in the first purifier is the front rank of the army corps, and stands the chief brunt of the attack of the enemy, and is, of course, the first to become exhausted. Then, by means of the simple opening of the grid-valve, the front rank is relieved from duty, thrown out of action, and the second rank is brought into play. Thus relief is obtained until it is thought convenient and desirable to empty the offending purifier and recharge with fresh material.

As an actual example of the practical working of a grid-valve which recently came under the writer's notice, the following particulars may not be out of place: In April last, an oxide purifier was put on as second purifier, because sulphuretted hydrogen was showing on a test taken at the outlet of the first purifier. This second purifier had already passed 7,979,000 cubic

eet of gas before it was made purifier No. 1. The first purifier was then thrown out of action. The new No. 1 purifier then passed a further 10,259,000 cubic feet of gas; and at this stage it began to give increased back-pressure, due to probably about 6 inches of the oxide of iron on the bottom tray becoming fouled and caked hard. The grid-valve was then opened (the lower tier bye-passed), and the pressure relieved. After this a further quantity of gas, amounting to 9,719,000 cubic feet, was passed through the purifier, making a total quantity of 27,947,000 cubic feet of gas, out of which 7,979,000 cubic feet passed through it as second purifier, and 19,978,000 cubic feet as first purifier. The oxide was then found to be completely fouled.

It may be added, in parentheses, that all purifiers do not give excessive back-pressure, although they may have been in use for some considerable period. Yet it may be necessary to change them, because the oxide or lime is fouled. Of course, valves could be devised by means of which every tier of sieves in the whole set of purifiers could be in turn bye-passed. But what would be the use of it? The last tier of sieves would eventually be reached, and then one would be purifying through a set of purifiers consisting of one tier of sieves only. This would be a *reductio ad absurdum;* and to avoid this, all practical inventions only go a certain distance. But when the necessity arrives, the invention will be there.

TECHNICAL RECORD.

GASES USED INDUSTRIALLY AS FUELS.

In a recent issue of the "Zeitschrift für angewandte Chemie," the above subject was dealt with by Dr. MESSERSCHMIDT. We have received from an esteemed correspondent the following abstract translation of the communication.

Coal gas is distinguished by the presence of hydrocarbons in large quantity, which give it its illuminating power. This property, however, is of less importance since the introduction of incandescent mantles. In addition, the improvements in gas-engines and in methods of heating, with the lowering of the price of gas supplied for power and heating purposes, have brought about the use of a large quantity of gas for these purposes. In the case of many gas-works, more than half the production is thus applied.

Gases produced by the combustion of carbon in air are of great importance. This combustion may take place completely to carbon dioxide (CO_2), as is aimed at in ordinary coal furnaces, or the process may be conducted so that the carbon dioxide is converted by the carbon into carbon monoxide, (CO) giving producer gas—

$$(\alpha)\ C + O_2 = CO_2$$
$$(\beta)\ C + CO_2 = 2CO$$
$$(\gamma)\ 2C + O_2 = 2CO$$

Air consists of 21 per cent. of oxygen and 79 per cent. of nitrogen. Instead of 21 parts of O, we obtain 42 parts of CO; and the gas has the theoretical composition—

CO, 34·7 per cent.; N, 65·3 per cent.

In practice the gas always contains varying quantities of carbon dioxide (2 to 10 per cent.), depending on the temperature of the producer; also 1 per cent. of methane (CH_4), from the bitumen of the coal, and hydrogen up to 6 per cent. by the decomposition of the fuel and from the moisture of the air.

If steam is led in along with the air to the heated coal, power or Dowson gas is formed, which contains a considerable quantity of hydrogen—

$$(\delta)\ C + 2\,H_2O = CO_2 + 2H_2 \text{ (heat evolved)}$$
$$(\varepsilon)\ C + CO_2 = 2CO \text{ (heat absorbed)}$$

According to the proportion of steam to air and other causes, the composition may vary between the following extremes:—

Gas.	Hotter.		Colder.
CO	38 p. ct.	..	22 p. ct.
H	10 ,,	..	24 ,,
CO_2	—	..	12 ,,
N	52 ,,	..	42 ,,

The gas produced in practice always contains carbon dioxide as well as some small quantities of methane and traces of hydrocarbons.

When coal or coke are heated to a high temperature in an air-blast, and the air is turned off and steam blown in, the product is water gas, the theoretical composition of which is: H, 50 per cent.; CO, 50 per cent. In practice, in consequence of incomplete reaction and secondary reactions, water gas always contains carbon dioxide, undecomposed water vapour, methane, and nitrogen. The mean composition of the gas obtained in practice is—

	Per Cent.		Per Cent.
H	50	CO	40
N	5	CO_2	5

The reaction is in a very high degree dependent upon the temperature of the generator and the speed of the steam. According to Bunte and Harris, the following quantities of water are decomposed:—

	Per Cent.		Per Cent.
At 874° C.	8·8	At 954° C.	70
,, 861°	48·0	,, 1025°	93

Thus the water gas produced at these temperatures has the following composition:—

	At 674° C.		At 1025° C.
H	65·0 p. ct.	..	50·9 p. ct.
CO	4·9 ,,	..	48·5 ,,
CO_2	29·8 ,,	..	0·6 ,,

These important results are explained by the large heat-absorption which takes place in the reactions—

$$C + H_2O = CO + H_2O.\ 28{,}760 \text{ calories absorbed.}$$

As this heat is taken from the coal, the process is not continous, The operation of gas making must be interrupted after falling to a certain temperature, and air must be blown in to raise it again to the necessary degree. Thus there are two phases in the operation—the heating blast (air) and the cooling blast (steam).

Of the many processes proposed, the following are the most important: The Humphreys and Glasgow (Lowe), the Strache, and the Dellwik-Fleischer. The first two are distinguished by the method of conducting the hot blast. The gas is produced using a high layer of coal and a low-pressure air-blast; while in the last the process is so conducted that the combustion in the hot-blast period is complete—*i.e.*, to CO_2.

Coming to the heat relations, according to the older process, we have—

$$C + O = CO.\ 28{,}800 \text{ calories evolved.}$$

To burn 12 grammes of carbon, 16 grammes of oxygen are necessary. The oxygen is accompanied by 52·9 grammes of nitrogen, and 28 grammes of carbonic oxide are formed. If the gases escape at 700°C., they carry away—

$$28 \times 0{\cdot}248 \times 700 + 52{\cdot}9 \times 0{\cdot}244 \times 700 = 13{,}895 \text{ calories.}$$

Thus leaving about 15,000 calories available. By the Dellwik-Fleischer process we have—

$$C + O_2 = CO_2.\ 96{,}960 \text{ calories evolved.}$$

Now, 12 grammes of carbon give 44 grammes of carbon dioxide; and the nitrogen introduced is 105·8 grammes. If the gases escape at 1000° C., they carry away—

$$44 \times 0{\cdot}217 \times 1000 + 105{\cdot}8 \times 0{\cdot}244 \times 1000 = 35{,}362 \text{ calories.}$$

Thus leaving about 60,000 calories available. In the Dellwik-Fleischer process, therefore, with the same coal consumption, four times the amount of heat is stored up for the production of water gas as is obtained in the older process. The method of working is: Air blast, 1 minute; steam blast, 10 minutes—or, per hour, 10 minutes for heating and 50 minutes for gas making. In the other processes only one-third of the time is available for the production of water gas. Consequently, the yield of water gas by the Dellwik-Fleischer process is much greater than by the others—2 cubic metres (70·6 cubic feet) of gas being obtained from 1 kilogramme of coke. The price (depending, of course, on the price of coke), including depreciation, interest, cost of labour, &c., is 1·5 pf. per cubic metre. If one concedes further the simplicity of the plant, the ease of working (only one or two men are necessary, even with very large producers), and the general properties of water gas, which may equally well be used for lighting, power, and heating purposes, the name "fuel of the future" is certainly not altogether unjustified.

Water gas enriched with oil is used for direct illuminating purposes, especially in America, where two-thirds of the gas-works produce such gas. For carburetting the gas, in the Humphreys and Glasgow apparatus it is passed through red-hot fire-clay chambers, into which the oil is dropped, and converted into easily volatile permanent hydrocarbons. To heat the chambers, the producer gas made during the hot blast period is used. In Germany, the high tax that is levied on oil prevents this application; but it is used with incandescent mantles, for which it is especially suitable on account of the temperature of the flame, which is higher than that of the other gas-flames. This temperature is not only dependent on the calorific value of the gas, but to a very large extent on the volume of the flame and the quantity of air necessary for the combustion. Experiment has shown that an Auer burner supplied with a mixture of 20 per cent. of water gas (calorific value 2500 calories per cubic metre) and 80 per cent. of coal gas (5000 calories per cubic metre) gave a flame considerably hotter than that produced when the burner was fed with unmixed coal gas, notwithstanding that the heating value had fallen from 5000 to 4500 calories.

Other practical advantages of adding water gas to coal gas are the remunerative utilization of the coke produced on the works, the simple working of water-gas plant (of great value in case of strikes), the speed of starting the producer, and the ease with which its working may be accommodated to the consumption. The advantages of gaseous firing are: (1) Cleanliness, (2) ease of regulation, (3) simplicity of working, and (4) excellent utilization of fuel, in consequence of the possibility of burning it without excess of air. The last-named advantage is of very great importance. There is an enormous loss of heat in firing boilers due to the neglect of this factor. With four times the amount of air necessary (*i.e.*, 5 per cent. of carbonic acid in the flue gases, which is not rare), and the temperature of flue gases 300° C., the excess of air alone means a loss of 45 per cent. of the fuel, which loss may, by rational working, be reduced to a smaller proportion.

REMOVAL OF CARBON FROM RETORTS.

During the past few years, various methods have been introduced for rapidly removing the carbon from gas-retorts by means of the injection of a jet of steam or a current of compressed air. One of the latest appliances for effecting this object has been devised by Mons. E. Farcot fils, of Paris, who has made a special study of ventilator fans; and it is described and illustrated in a recent number of "Le Gaz." It is based upon the employment of an electric fan mounted on a carriage, and furnished with a winch which can be turned as required to guide the jet of air in any direction. The accompanying illustrations give a clear idea of the general arrangement of the blower, and consequently render unnecessary a long description of it.

Fig. 1 shows the appliance mounted on the carriage, which can be run to the front of any setting the retorts in which it is desired to scurf; fig. 2 represents it in operation. It will be noticed that it can be placed outside the retort-house, in which case the air is conveyed through a fixed pipe in the open, with supply-pipes descending therefrom opposite each setting; or the blower may be located in such a position that it can be brought into direct communication with each of the retorts by means of a moveable telescopic pipe, which can be moved into the desired position, as shown by the arrows in fig. 2. Where there is motive power on the works, the pipe fixed in the open air, with telescopic and kneed air-supplies before each setting, can be adopted. The arrangement shown in fig. 2 is, however, more elegant and convenient; the blower being driven by an electric motor mounted on the same shaft. Facility in moving the appliance to the front of each setting renders unnecessary the use of a fixed pipe, and the plant is consequently less costly. A blower 28 inches in diameter, furnishing 14 cubic feet of air per second, at a pressure of 6 inches of water, is amply sufficient for the rapid removal of the carbon from retorts.

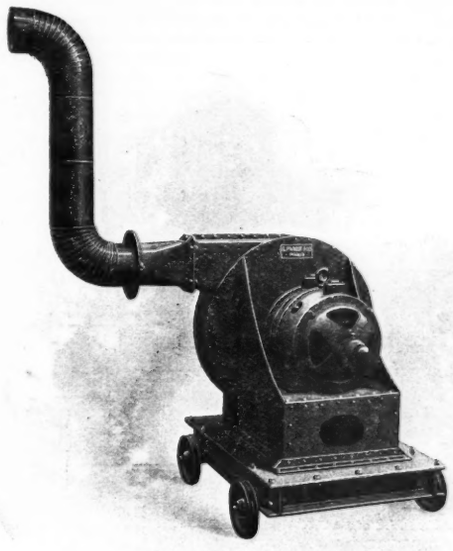


FIG. 1.

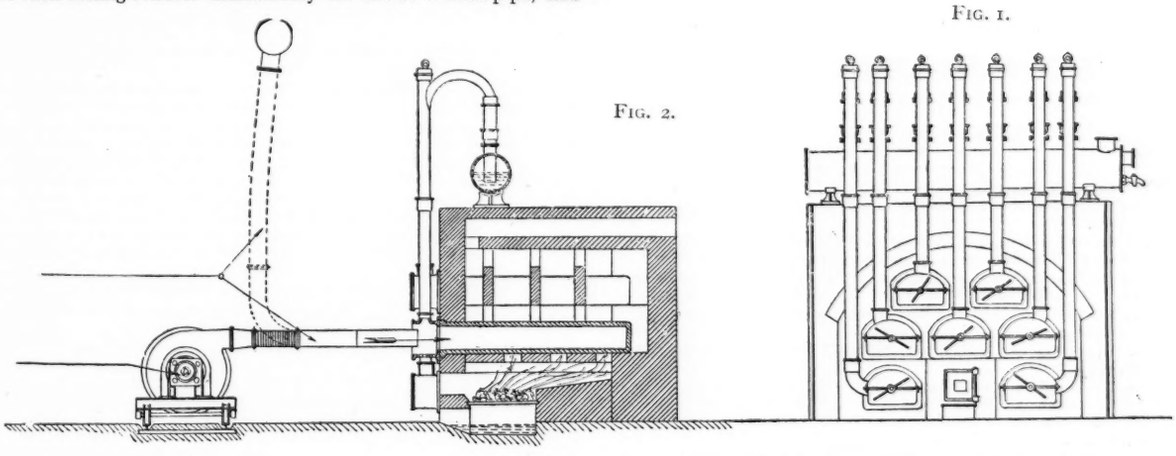


FIG. 2.

The system has been tried in several gas-works in France; the appliances used being from 10 to 32 inches in diameter. The cost, of course, varies with size and with the power employed.

The Inverted Incandescent Gas-Lamp.—Readers of the "JOURNAL" will doubtless remember that early last month we recorded a successful attempt to produce a thoroughly reliable inverted incandescent gas-burner. The experiments which led to this result were carried out under the supervision of the Inverted Incandescent Gas-Lamp Syndicate, who were so assured that their burner would give satisfactory results in general use, that steps were taken to make it more widely known. Accordingly, as will be seen by the announcement which appears elsewhere, a Company has been formed, with a capital of £125,000, in £1 shares, to purchase the invention, which is that of Messrs. J. Bernt and Emanuel Cervenka, of Prague, and the patents protecting it for Great Britain, the United States, Canada, and the most important of the British Colonies and Dependencies. Of the total number of shares, 65,000 will go to the vendors in part payment of the purchase money (£75,000), 35,000 are held in reserve for future issue, and the rest are offered for subscription at par. The burner was so fully described on the occasion already referred to, that it will suffice to state here that the advantages claimed for it are its attractive appearance, illuminating effect, cleanliness, safety, economy, and adaptability to existing fittings. Moreover, it is stated to be absolutely shadowless; and when certain improvements now being made are carried out, it will be practically draught-proof. The prospectus contains a list of some of the firms and companies to whom burners have been supplied. It is the intention of the Company to include in their business the sale of mantles, fittings, and accessories. The Chairman of the Company is Mr. Elie Hinton, a Director of Messrs. W. A. S. Benson and Co., Limited; and one of the Directors is Mr. Henry Woodall, Assoc.M.Inst.C.E. (son of Mr. Corbet Woodall). The subscription list will close on the 22nd inst. (to-morrow) for town and on the 23rd for the country.

REGISTER OF PATENTS.

Street-Lamps.—Rech, F., of Köln-Ehrenfeld, Germany. No. 20,616; Oct. 15, 1901.

This invention refers to a street-lamp crown or top for incandescent light lanterns, provided at its upper part with a reflector surrounding the protecting glass and the incandescent light cylinder, and a wind-protecting hood. The special feature of the lantern is that either the reflector or the hood or both are arranged so as to be capable of removal or of being folded or turned to one side by means of a joint, hinge, pivot-pins, screw-threads, or the like, for the purpose of conveniently cleaning and changing the protecting glass and incandescent light cylinder. The arrangement was described and illustrated in the "JOURNAL" for Aug. 19, p. 494.

Retort-Drawing Machinery.—Goulden, T., and Johnson, J. C., of Beckton. No. 21,936; Oct. 31, 1901.

The object of this invention is to facilitate the handling of coke on its withdrawal from the retorts in the case of stage-floor retort-houses which have coke-holds. The method of effecting this is by an addition to existing drawing machines. On the rake withdrawing coke from a retort, instead of allowing it to fall into the coke-hold in the usual way, it is drawn into a trough parallel to and under the beam which carries the rake-rod. It is then conveyed towards the rear of the machine, and is discharged at a suitable point through the stage-floor into the coke-hold below, or, if necessary, conveyed by a shoot or other means into trucks. The operation is controlled by the man at the drawing machine simultaneously with the withdrawal of coke from a retort.

A number of ways in which the invention can be carried out are shown and explained in the specification – see next page.

Fig. 1.—By having a loose (so-called feathered) rake-head A placed at the tail end of the rake-rod B. On the rake-rod withdrawing its charge from the retort, the coke having been drawn back into the trough on the first stroke, the rake-head A on the return stroke engages with the coke already in the trough, and pulls it towards the back part of the machine—thereby acting simultaneously with the withdrawing of the coke from the retort.

Fig. 2.—This is similar to No. 1, with an additional rake-head C in the middle of the rake-rod B, so arranged that it is capable of sliding along the rod B in going in; but on the return stroke, a pin D, which is fixed cross-wise in the rod B, engages the rake-head C, and thus passes

the coke to the rake-head A for the next stroke. The front bearing E of the rod B has a slot on either side, to allow of the ends of the cross-pin D passing through—as in E, which is shown in cross section.

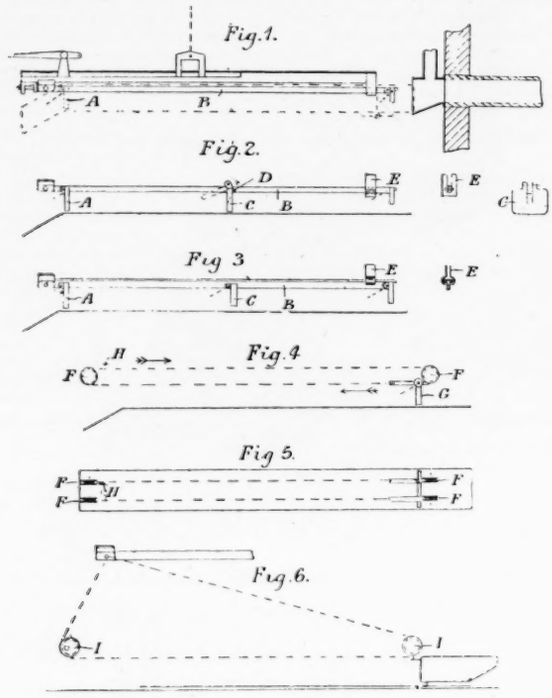


Fig. 3.—The rake-rod B is made in T-bar section, and its front bearing E is so arranged that its rake-head C can pass into the retort; the rake-head C in this instance being attached to the rod B in the ordinary way.

Figs. 4 and 5.—On both ends of the beam supporting the rake-rod are fixed wheels F, which carry an endless chain. Attached to this is the rake-head G, but placed at the front end. At the top back end H, the chain is attached to the rake-rod. The operation in this case is reversed; for the coke is being pulled back while the rake-rod is going into the retort. This equalizes the power.

Fig. 6.—The wheels I are fixed to the bottom framing of the machine; and, instead of having a rake-head, it has a small truck which has a moveable bottom to discharge its coke on getting over the opening at the rear of the framing. It is controlled the same as in figs. 4 and 5; the chain being lengthened or shortened when the beam is being raised or lowered for the various levels of the retorts being drawn. A form of endless belt or other type of conveyor can be used instead of rake-heads, which may be controlled also by the rake-rod. In this case, the conveyor is placed in the bottom of the machine, and is connected in such a manner that the conveyor can rotate or oscillate according to the type of conveyor used. The method of applying the power may be altered to suit the various kinds of drawing machines, and need not necessarily be connected directly with the rake-rod.

Regenerative Retort-Settings.—Hislop, G. R., of Paisley. No. 22,102; Nov. 2, 1901.

This invention in regenerative or recuperative settings for gas-retorts is intended to allow of a greatly reduced depth for such furnaces.

Fig. 1 is a transverse vertical section of a bench of retorts located over a gas-producer constructed in accordance with the invention. Fig. 2 is a longitudinal sectional elevation. Fig. 3 is a horizontal section.

The waste-gas flue A is constructed within the setting, immediately under the last heating flue B, beneath the lowest of the retorts C on both sides of the producer D, each flue A, which may be of round, dee, square, or other suitable form, being for the purpose of heating the secondary air on its way to the combustion chamber E. Over and around the waste-gas flues are a series of air-flues F, in which the air is made to travel from front to back over and on each side of the body of the flues, or else transversely and around a series of partition walls extending from opposite sides of the air flue F to within a short distance of the side towards which they extend. In this way, the heat of the waste-gases passing through the flue A is taken up by the secondary air passing through the flues F on its way to the combustion chamber E on each side of the producer-crown D. The air is conducted through a flue F^1 carried longitudinally over the crown of the producer, and extending from back to front of the oven. This flue is furnished with a series of openings placed along its sides, and through which the secondary air escapes into the combustion chamber or chambers E, in which it meets the gases from the producer. Or the secondary air may be made to travel round the waste-gas flues A spirally, for the same purpose.

Apart from its connection with the air-flues F, the patentee provides for the application to any existing regenerative retort-settings, of the central perforated air tube or flue F^1 extending from back to front of the oven. By these means, the secondary air is more highly heated before it enters the combustion chambers, and at the same time the intense local temperature in the centre of the oven is modified and the life of the retorts placed immediately over the producer, and the secondary air-flue is prolonged.

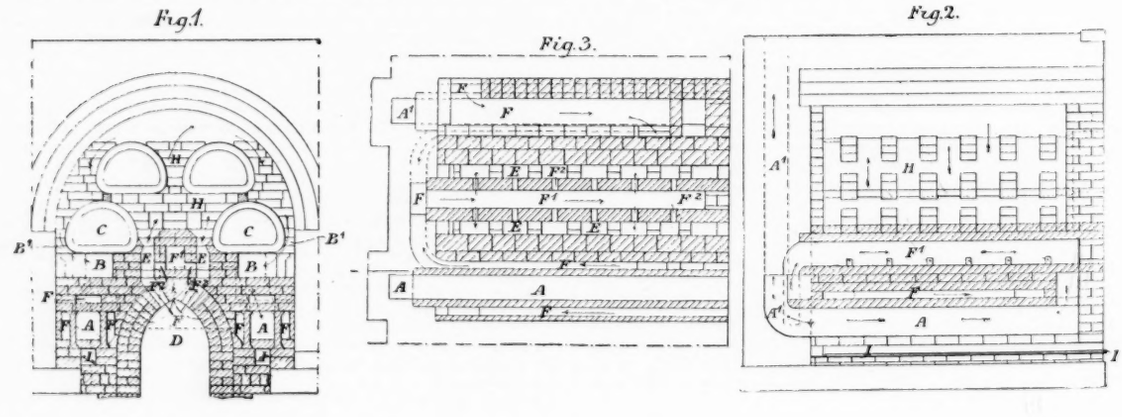
The arrows show the path of the combustion gases from the producer D and combustion chambers E up through the open brickwork H, down through the spaces B^1 along under the flues B under the lower retorts C, thence down into the horizontal heating-flues A, and, finally, by the uptake flue A^1 to the chimney. The darts represent the passage of the secondary air along the flues F on each side and over the heating-flues A, thence towards the central flue F^1, and through the openings F^2 to meet the hot gases at the combustion chambers E. Coils of piping I may be fitted under the heating-flues A for heating water passed through the coils, and converting a portion or the whole of the water into steam for working the producer.

Manufacture of Gas.—Schill, C. H., of Hyde. No. 22,349; Nov. 6, 1901.

This invention relates particularly to the process described in Lane's patent No. 17,762 of 1900; the patentee having found, in the practical working of the process, that a certain quantity of the hydrocarbons pass out of the generator with the permanent gas as vapour, which condenses on cooling. The object of his improvements is to convert such vapour into permanent gases, and thereby avoid the tardy deposit which otherwise takes place. This he does by the addition of a further step to the complete cycle of operations described in Lane's specification—that is to say, as the gas leaves the generating plant it is conducted into an intermediate holder large enough to receive all the gas produced in one cycle. At the end of the make, the gas from the intermediate holder is forced or drawn back through the incandescent fuel in the generator, and thence to the ultimate store holder, or to its work when the gas producing plant is duplicated.

APPLICATIONS FOR LETTERS PATENT.

21,683.—Fielding, J., "Internal combustion engines." Oct. 6.
21,698.—Priest, A., "Internal combustion engines." Oct. 6.
21,717.—Mackrow, G. C., and Cameron, H. G., "Storing coal." Oct. 6.
21,725.—Stoess, L., "Chimneys for incandescent gas-burners." Oct. 6.
21,744.—Cohen, M. I., "Gas-burners." Oct. 6.
21,746.—Schroeder, O. E. L., "Automatic gas-igniters." Oct. 6.
21,755.—Hamilton, J. H., "Internal combustion engines." Oct. 7.
21,861.—Worsnop, C. H., "Incandescent gas-mantles." Oct. 8.
21,867.—Cockburn, G., "Reducing valves." Oct. 8.
21,929.—Marshall, G., and Kilby, H., "Increasing the illuminosity of gas-flames." Oct. 9.
21,964.—Walker, C., "Acetylene generators." Oct. 9.
22,002.—West, J., "Charging and drawing machines for gas-retorts." Oct. 9.
22,070.—Cox, W., and Glover, G., and Co., Ltd., "Coin-controlled apparatus for delivering gas." Oct. 10.
22,092.—Tully, C. B., "Manufacture of gas." Oct. 10.
22,117.—Tannett-Walker, F. W., "Transferring coal." Oct. 10.
22,138.—Scherff, H., "Spherical valves for gas-pipes." Oct. 11.
22,149.—Frings, J. W., "Valves for internal combustion engines." Oct. 11.
22,180.—La Société Radiguet and Massiot, "Electric ignition devices for gas-burners." Oct. 11.



CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Affairs of the Greenock Gas Department.

SIR,—I infer from Mr. Mitchell's letter, in your issue of the 7th inst., that he is not to avail himself of my proposal that he should take his complaint to the Town Council of Greenock, and have his position vindicated there. It is only natural that Mr. Mitchell should advocate stoking machinery at any cost and under any circumstances.

The "unemployed stoking machinery at the Greenock Gas-Works" (see "JOURNAL," Dec. 24, 1901, p. 1680) was introduced here during Mr. Mitchell's term of office as Chairman of the Gas Committee, at a time when the then Engineer was on the eve of his retirement from active duty; and if cost, circumstances, or efficiency (or any other *desideratum*) was neglected in the arrangement of the plant, it is no part of my duty to apportion the blame. Suffice it to say that my Committee—after several attempts to work the machinery economically had failed—decided to get at the cause.

A Special Committee, consisting of Mr. Mitchell and several other good business men, was appointed, and entrusted with the carrying out of experiments upon machinery *versus* hand labour. Although on this occasion these were directed by experts retained by the Contractors—gentlemen well qualified to obtain the highest possible efficiency—it was again found that the difficulties in the way of proper working were, as I had already reported—insuperable; that hand labour, under the circumstances, was vastly superior in yield of gas per ton of coal carbonized, and more economical in actual wages paid.

To remedy certain defects, a further large capital expenditure was recommended by the Contractors, and agreed to by the Town Council; and the work then proposed is now in progress. Personally, I am disposed to sympathize with, rather than criticize, those who have been responsible for the original scheme. I consider it my duty to make the best of the existing adverse circumstances, and to support my Committee in their efforts to render the working of the machinery more efficient. At the same time, while I am succeeding, with the remnant of the old carbonizing plant introduced 30 years ago, in effecting economies sufficient to meet the increased capital charges incurred by machinery which cannot be worked economically, and also providing a surplus sufficient to meet the charges on the additional plant which it is calculated will make such machinery workable, I think it is the duty of Mr. Mitchell to accept gracefully (like those gentlemen who acted with him, and partly under his guidance) his share of the responsibility—the more especially as the present Town Council are, by economical working in every department, reducing the debt and deficiency incurred during Mr. Mitchell's term of office.

WM. EWING.

Greenock, Oct. 18, 1902.

SIR,—It is quite clear that if I try to follow your correspondent into all his mystifying tactics in this discussion, the end will be very far off. In every one of his articles since the first, he has raised new issues which have no connection at all with his first assertions. To these I must again call his attention.

First of all, then, your correspondent writes: "I find that the estimated yield for the past twelve months was 9600 cubic feet per ton." Secondly: "During the first ten months of last year, the yield was 10,215 cubic feet per ton." Thirdly: "Last year, Mr. Ewing, with 1218 tons of coal less, produced 12,350,000 cubic feet of gas more than was produced in the preceding year." Fourthly: "The year before last . . . it is remembered that the Convener of the Gas Committee was able to convince his colleagues that a marine boiler was the most appropriate for use in a gas-works." Fifthly: "Last year it [the boiler] consumed about 5000 tons of good coke, which was a heavy loss to the undertaking." I want the authority of your correspondent for making the above five statements. When he gives it I will consider how to act further.

With Mr. Ewing's rather curious telegram, I shall no doubt be able to deal when I see the letter he is writing.

THOS. MITCHELL.

27, *Lyle Street, Greenock, Oct.* 17, 1902.

Ownership of Railway Coal-Trucks.

SIR,—I have seen the article on the above subject in your issue of the 14th inst., and would offer an opinion such as you express a wish to hear.

It seems obvious that, when founding your article on the letter of "S. R. B.," which appeared in "The Times" of Sept. 22, you had not seen that of Mr. Charrington of Sept. 26, or my reply to "S. R. B." printed in "The Times" of Sept. 30, or I think you would have substantial reason for modifying your appreciation of the former communication. "S. R. B." writes indeed with an assumption of knowledge unfortunately not uncommon with those who for all practical purposes are apparently unacquainted with the subject of which they treat; and I can only regret that some of his fallacies should appear again in your valuable "JOURNAL."

I may point out to you that all persons in the United Kingdom have a legal right to run their own vehicles on the public railways, and that the Railway Companies have no more compulsory power to buy up private waggons, or to prevent their running, than the public have to prevent the Companies from running their own rolling stock; and I think I may say—having some knowledge of the subject—that no Railway Company desire to do any such thing, even if they had the power. A moderate acquaintance with railway law would have saved "S. R. B." from making so absurd a suggestion.

Again, the Midland and the North-Eastern Companies mentioned by "S. R. B.," and referred to in your article, are not exempted from the law; and private owners have, and exercise, over those lines precisely the same rights as over other railways of the kingdom—rights which, not in the case of these two Companies only, the Association of which I am Chairman was founded to protect.

It is true, and private owners readily recognize the fact, that Railway Companies have power to issue and enforce (and very properly so) regulations as to the construction and condition of rolling-stock using the lines. But these regulations must apply equally to their own stock; and I venture to affirm that the statement that private owners' waggons are poor and shaky, or unnecessarily heavy, is devoid of foundation. All private owners' stock was built to the Railway Companies' specifications prior to 1884. Each Company issued its own regulations for this purpose. But since that date, regulations common to all the Companies have been in force. As the Companies have ample powers of inspection of private owners' waggons before they come, in the ordinary course of traffic, on their lines—a power of which they fully and properly avail themselves—they are clearly to blame if a defective waggon is allowed to run.

Having thus touched briefly on the fallacies contained in the letter referred to in your article, may I suggest that the 4000 or more waggon owners who possess 500,000 (probably now more nearly 600,000) vehicles in which they have invested between thirty and forty millions of money, and without whose stock the trade of the country could not be carried on, are entitled to consideration, and to a little more respectful treatment than persons ignorant of their rights and usefulness seem disposed to accord them.

It must not be supposed that waggon owners are averse, or indifferent, to improvements in rolling-stock, although they will certainly require to be satisfied that alterations in size, or otherwise, are really improvements. Nor must it be thought that the large-capacity waggon is new to them, since it has been considered and discussed for years past. But beyond the possible saving in haulage—and on this railway authorities are not agreed—there are other questions involved, of serious importance to traders.

For instance, it is essential to colliery owners that they should have under their absolute control rolling-stock which they can send to any customer. It would be unworkable to have one class of waggon to go here, and another to go there, unless their trade was with one port or person, which is hardly ever the case. This will be readily understood by all who are practically acquainted with the working of a colliery. At one or two ports large-capacity waggons may be dealt with; at others they cannot. Some gas-works, some iron-works, may be able to take in a 20-ton or 30-ton waggon; others cannot. Railway Companies are building 20-ton waggons for the carriage of their locomotive coal, and they can utilize them; but when we come to the general run of coal merchants (of whom there are many thousands in this country), the large-capacity waggon would not suit their trade, and would therefore be met with the strongest possible objection by them. A vast proportion of coal merchants at country stations send orders to collieries for small quantities—6, 8, and 10 tons at a time; and if a general ascertainment of their views, and of those of private consumers who often buy truck-loads, were made, they would generally be found in favour of an 8-ton truck, rather than even a 10-ton one. Again, a very large number of coal merchants own their waggons, and have bought them of a size suitable for their business.

Of course, it may be urged that all these people do not know what is good for them, and should be compelled to use a big waggon, whether they want it or not, because there may be a saving in the cost of haulage. But it must be remembered that the possible saving will be of no advantage either to the colliery owner or to his customer; while the latter will suffer some loss from the larger proportional reduction of round coal to slack in transit, due to the greater bulk carried.

At many collieries—probably the larger number—waggons of materially increased width and height cannot be received without extensive alterations to screens, supports, sidings, &c. Any increased capacity must, beyond narrow limits, be obtained in increased length of waggon, unless colliery owners are willing to incur a large outlay from which they would derive no benefit.

It has been said—when comparing English with American practice in the matter of waggons—that English trade may be described as retail and American as wholesale; and I would suggest that each country has adopted rolling-stock suitable to its requirements. Not that I would for a moment say that large-capacity waggons will have no place in the trade of this country. I am sure they will; but their use will be special, and not general—certainly for many years to come, if not permanently.

The difficulty of the adequate supply of rolling-stock to meet the demands of trade, were it solely in the hands of the railways, has been ably dealt with in your article. But I would remind your readers that Railway Companies are under no legal obligation to supply rolling-stock at all; and the confusion and loss that would occur—especially when trade was brisk—were colliery owners, merchants, and others dependent solely on the Companies for waggons, are difficult to imagine. I am bound to say that, with possibly one or two exceptions, I know of no Railway Company desirous of placing themselves in any such position, since they know well the trouble and worry it would entail, and the loss they would suffer, in times of depression, from thousands of waggons standing idle, dissipating those pleasant dreams of the enormous profits arising from the ownership of waggons which private owners know too well are little more than dreams, since persons generally own waggons only because they cannot carry on their business without doing so.

W. F. BUTLER,
Chairman of the Association of Private
Owners of Railway Rolling Stock.

Chester, Oct. 18, 1902.

SIR,—I have read with interest the article in the "JOURNAL" on the ownership and capacity of railway coal-trucks. I have not read the article in "The Times" to which you refer; but whoever the writer is I challenge him to prove his remark that "the private wagons stand in the way of all improvements in the methods of conducting the mineral traffic of the country, and must therefore be abolished." It is well known that one of the great Railway Companies some years ago endeavoured to command all the railway waggons owned by certain collieries, and bought them at an agreed price—

giving the Companies the promise to supply them with all waggons necessary for taking the outputs of the collieries. This, I believe, proved practically a failure, as the Railway Company were not in a position to fulfil their promise; and therefore the collieries again went into the market and bought waggons.

With regard to the size of waggons, I do not think that waggons of 30 to 60 tons capacity will ever come into use in England to any great extent; but I think that waggons of 15 tons capacity, built on four wheels, might be the standard waggon for the bulk of the coal trade in England. Holding this view, I some months ago instructed the builders to make a sample 15-ton waggon, and I am expecting to have it running in a week or so. I shall be pleased at a future date to let you know more about the experiment.

117, *Leadenhall Street, E.C., Oct.* 15, 1902. W. B. LAMPARD.

Using Gas-Engines for Driving Dynamos.

SIR,—Our attention has just been called to the interesting report of Professor D. S. Capper to the Dumfries Town Council, on the use of gas or steam as motive power for their proposed electricity works, which you published in your issue of the 23rd ult.

There are certain statements in the report in respect to which Professor Capper must have been entirely misinformed. He proceeds to say: "Hitherto in this country, and, as far as I am aware, on the Continent or in America, the chief example of a direct-coupled gas-engine is the Westinghouse two or three crank engine; and practically the only firm who have had experience of driving generators direct coupled to gas-engines in this country are the Westinghouse Company, and even their experience is not extensive."

So far from this being the case, the well-known British firms, Messrs. Crossley Brothers, and the Premier Gas-Engine Company, have both numerous most successful examples of direct-driving of large generators by gas-engines of their manufacture.

At the works of Messrs. Brunner, Mond and Co., at Winnington, there are three engines by these makers driving 300-kilowatt continuous-current dynamos manufactured and designed by us. Two of these have been in continuous operation for some years; and a third has been recently installed. This plant was fully described in Mr. Humphreys' classical paper on the "Mond Producer."

A large chemical works in the Midland Counties has a power plant of six gas-engines each of 500-horse power, driving direct alternate-current machines, also of our design and make, of 300-kilowatt output, which have been in operation for some twelve months.

Other examples may be mentioned in this country; but these are sufficient to show that it is in England, rather than in America, that the greatest progress has been made. Although these plants are for electrolytic work, the plants are in all respects applicable, and the steadiness of turning suitable, for the public supply of energy for electric lighting and power.

In Germany, greater advances have been made—perhaps in some respects more remarkable—than those made in this country. The Oechelhauser Company, and the John Cockerill Company, of Serang, have both examples of gas-engines of 500, 600, and 1000 horse power, driving dynamos direct for various purposes—particularly for power distribution. But the most important and latest examples of successful enterprise in this direction may be found in the application of Mr. Ernest Körting's double-acting two-cycle gas-engine. Two splendid examples of this gas-engine are to be seen at the Düsseldorf Exhibition, though not in this case employed for driving dynamos. At the works of the Gutehoffnungshütte (Oberhausen), however, two out of a series of six engines of 500-horse power have already been installed, and have been at work for some time driving alternate-current dynamos, both for power and lighting purposes, with the greatest success.

We are ourselves licensees of Mr. Ernest Körting for the manufacture of his engines in this country, and at the present time have engines on order of 500, 700, and 1000 horse power, intended for driving dynamos direct, to be used for electrical power, electric lighting, and electrolytic purposes.

MATHER AND PLATT, LIMITED.
Manchester, Oct. 14, 1902. E. Hopkinson, Managing Director.

Gas Supply at Innerleithen.

In last week's "JOURNAL" we published (p. 1036) some particulars as to the Innerleithen Gas-Works sent by a correspondent who occasionally forwards such matter to us. We much regretted to receive from Mr. Bell on Friday a complaint that several of the statements made were contrary to the facts. In reply to a request for particulars, Mr. Bell points out some instances in which the correspondent has been the means of misleading our readers; and we are sorry that this should be so. Mr. Bell, however, expresses himself as content if we simply make it abundantly clear that the particulars given did not emanate from him, though he saw the correspondent who forwarded from Glasgow the report as published.

At a recent meeting of the Civil and Mechanical Engineers' Society, Mr. Ebenezer Howard read a paper giving particulars of the engineering features of the proposed Garden City scheme. In the course thereof, he mentioned that the lighting would probably be done partly by gas of a poor quality with incandescent mantles, especially in the streets; and as the same gas could be used for cooking and warming, there would be no smoke, no need for household coal, and much household drudgery would be done away with. In the houses the electric light would in all probability be most popular; and with the very high load factor which might be expected, he said it should be cheap. The distribution of energy, water, heat, light, gas, telegraph and telephone wires, pneumatic tubes for parcels delivery, the removal of sewage, and possibly even house and street refuse, would be enormously facilitated, and consequently cheapened, by a thorough system of subways, which, instead of being completely and solidly covered in, might be made with less than the usual headway, but with moveable covers so as to be readily accessible from the roadway.

MISCELLANEOUS NEWS.

HEREFORD CORPORATION GAS SUPPLY.

Reduction in Price—Disposal of Coke.

At the last Meeting of the Hereford Town Council—the MAYOR (Alderman J. R. Symonds) in the chair—the above subjects were under discussion on a report presented by the Gas Committee, in the course of which they recommended that, in view of the more favourable terms of the coal contracts lately entered into, the additional 3d. per 1000 cubic feet imposed on the ordinary consumers in September, 1900, to meet the increased cost of coal, should now be taken off.

The MAYOR, in moving the adoption of the report, explained that the Gas Committee, of which he had the honour to be Chairman, had made the recommendation in regard to the price of gas solely on consideration of the working of the year. At the same time, some of them thought—at any rate, he did—that the reduction would not have been justified had they not borne in mind the very different position they would be in next year in consequence of the lowering of the capital charges. Here he would appeal to the Council, and through them to the gas consumers generally, not to expect any great or immediate reduction in the price of gas in consequence of the alteration in the charges connected with the repayment of the capital. When he told them that a reduction of 3d. all round meant a loss to the concern of £1400 in the year, it did not require any very intricate calculation to see that very few threepences would take away the £2000 or £3000 they were going to save. Beyond this, it was their duty to be just before they were generous; and it must be borne in mind that next year they would have some fresh capital charges coming upon them amounting to some £600 a year, besides which the position of the gas undertaking itself wanted some looking into. To his mind, a good deal more money was required to carry on the concern. It was quite true that they had paid the last of the instalments, and that the deeds were now lodged in their own strong-box instead of being in the hands of the mortgagees; but, so far, every shilling of that money had been borrowed from their bankers, and was still owing. The next point, which was a very important one, for their consideration, was the position of the improvement account, of which the gas-works themselves formed an integral part. This improvement account had found a great deal of money in times past for the aid of the works through the public lamps; and it was the paramount duty of the Corporation to take that opportunity of seeing that the account was put into such a condition that the possibility of ever again incurring a city rate should never happen. Passing on to refer to the alteration in the illuminating power of the gas supplied in South London, which had, he said, proved to be in every way satisfactory, he asked how it was that a Company having the interests of shareholders to serve were able to satisfy their consumers with gas of 14-candle power, while consumers at Hereford were certainly not unanimously satisfied with the standard of 18 candles. Surely an operation conducted by a Company who had disarmed the opposition of the London County Council in this matter, and had so converted them that they were advocating a lowering of the standard for the rest of the Metropolis, was one that ought to have a great future before it, where the gas consumers put into their own pockets the profits that could be saved after a reduction in the price. He hoped this matter would have the attention of the Committee; and if it were their pleasure that he should remain upon it after November next, he would give it his personal attention.

Mr. WITTS seconded the motion.

Mr. RALPH expressed the opinion that very little credit had been given to the consumers who had enabled the Committee to take off the 3d. If it had not been for the success of the penny-in-the-slot meters, the Committee would not have been in the position of being able to reduce the price of gas. He hoped that next year it would be the intention of the Committee to think of those persons to whom gas was supplied on the prepayment system. He quite believed that there was now no necessity for gas of 18-candle power.

Mr. EDWARDS said the consumers had been assured that when the gas loans were paid off they would get a material reduction in price. He was a member of the Gas Committee, and he felt they would have been perfectly justified in taking off a larger sum than 3d. per 1000 cubic feet on the present occasion. He thought the consumers, having paid off the whole of the amounts to which he had referred, were rightly entitled to a material reduction in the price of gas in the coming spring, and in this he felt the consumers who adopted the penny-in-the-slot system should fully share.

Mr. WALLIS referred to the increasing stock of coke at the gas-works, and asked the reason for it.

Mr. GURNEY expressed his pleasure that attention had been called to this matter, for he had been told that it was cheaper—about 1s. a ton—to buy coke 50 miles away from Hereford than in the locality.

The MAYOR remarked that the difficulty was to get rid of the coke. He had heard that terms had been accepted for most of it to go to London. In dealing with large quantities of coke, and sending it away by the train load, the Committee were bound to take a very different price from that which they would accept when selling it by the waggon load for private consumption. Quantity regulated the price, and the Gas Committee felt this matter so keenly, that they had appointed a Sub-Committee to interview the different coal merchants of Hereford, in order to see whether they could come to some arrangement. With regard to the reduction in the price of gas, there was no doubt that the next would include prepayment consumers. The 3d. per 1000 cubic feet which was put on to meet the increased cost of coal did not affect the supplies through automatic meters. The reduction to the slot-meter consumers would take the form of discount. He might remind the Council that when the gas-works were acquired the price of gas was 4s. per 1000 cubic feet. In 1877 it was reduced, in the form of

discounts, to 3s. 9d., in 1882 to 3s. 6d., in 1888 to 3s. 3d., and in 1894 to 3s., to which sum they had brought it down again. There had been 25 per cent. reduction in the price since the gas works had been in the hands of the Corporation. Had it not been for this, the 25 per cent., together with the increased supply and very much improved quality, would never have come to the consumers. Therefore, he did not think they had much to find fault with. In 1872, during the time of the old Company, the charge for the public lamps was 4s. per 1000 cubic feet, or £1020; and in 1888, while the price had been lowered to 3s. 3d., the charge had risen to £2408. Though the number of lamps had increased in new districts, the charge was practically no higher now than it was in 1888. These were facts which he wished to bring home to the Council. The bulk of the money had been found by their best customer, the public lighting.

The report was adopted.

HALIFAX GAS-WORKS INVESTIGATIONS.

The Capital Expenditure on New Works.

The "Halifax Evening Courier" has reproduced the third report in connection with the special inquiry into the affairs of the Halifax Corporation Gas-Works. The Special Sub-Committee appointed comprised Messrs. A. Crabtree, J. A. Drake, R. Morley, J. Pearson, and G. W. Wadsworth. An account of their findings has already been published, as well as the gist of the reply to their report by the Engineer, Mr. T. Holgate. Accompanying those documents was a statement by the Borough Accountant (Mr. Nicholl) of the expenditure on the gas-works capital account. It is as follows:—

GAS-WORKS.

Statement of Expenditure on Capital Account, April 1, 1898, to June 30, 1902.

Act 1898. Works Required for next Ten Years.	Estimated Cost.	When Authorized.	Tenders.	Actual Cost.
New mains	£30,000			£25,039
New meters	10,000			11,460
Gasholder	50,000			
Land and boundary wall	1,000	June 15, 1898	£174	509
Extended railway siding	2,500	Aug. 8, 1900	£5,580	
Extended coal-stores	2,500	Dec. 12, 1900	2,196	
		Sept. 18, 1901	1,825	
Weighing-machine		Oct. 10, 1900	216	
Hoist		Jan. 9, 1901	193	
Overhead cistern		Feb. 20, 1901	1,444	
Rolled steel joists		Nov. 27, 1901	226	
			£11,680	8,876
Coal breaker, elevator, and conveyor	2,200	June 13, 1900	£1,315	
Steam-engine	500	June 24, 1900	350	
			£1,665	1,722
Retort-house	5,000	May 30, 1900	£3,114	
Roof		Oct. 29, 1897	1,425	
Girders		Dec. 15, 1897	2,184	
Slates		Sept. 21, 1898	579	
Roof		May 31, 1899	1,196	
		June 7, 1899	213	
Staircases		Feb. 20, 1901	330	
			£9,041	18,621
Inclined retorts and fittings	5,300	April 6, 1898	£684	
		Aug. 7, 1901	160	
		Sept. 27, 1898	1,762	
		Sept. 27, 1898	214	
		Mar. 21, 1900	3,285	
		May 30, 1900	245	
			£6,350	26,187
Buildings for boilers, exhausters, pumps, engine	2,500	Feb. 2, 1898	£114	3,807
Cisterns over these	1,400			1,510
Boilers	1,500	Aug. 11, 1897	746	
(Superheaters)		Sept. 6, 1899	160	
(Two boilers)		June 26, 1891	2,000	
		April 5, 1899	324	
		May 3, 1899	1,670	
			£4,900	2,905
Chimneys	1,000	May 2, 1900 (Shaft)	£483 (5)	2,667
Condensers and connections	2,800	July 6, 1898	2,666	3,158
Exhauster	800	Aug. 4, 1897	648	627
Ammoniacal liquor tank	1,600	Jan. 24, 1900	2,356	2,896
Liquor-tank				224
Sinking well				195
Pumps	900	Sept. 6, 1899	1,095	2,094
Scrubbers and washers	9,000	Aug. 4, 1897	4,968	
		Dec. 1, 1897	3,150	
			207	
			£8,325	8,379
Purifiers and building	11,000	Feb. 9, 1898	4,566	
		April 6, 1898	5,586	
Oxide elevator and conveyor	2,000	May 30, 1900	850	
			£11,002	15,263
Sundries and contingencies	6,500			880
	£150,000		£60,499	£137,019

Additional Works.

	When Authorized.	Tenders.	Actual Cost.
Brought down		£60,499	£137,019
Moulders' Arms	June 21, 1899	5,350	5,350
Carburetted water-gas plant	Sept. 8, 1897	4,861	
	Feb. 2, 1898	509	
	July 26, 1899	255	
	April 28, 1902	135	
		£5,760	8,914
Stoking machinery	July 12, 1899	£39	
	Mar. 21, 1900	5,704	
		£5,743	6,657
Coke-conveyors	May 30, 1900	8,814	
Engine	Feb. 7, 1900	370	
		£9,184	10,661
Economizer	July 10, 1901	457	457
Tar distillery vessels	Sept. 6, 1899	£645	
Roof over tar-still	Jan. 1, 1901	170	
Tanks and cylinders	Dec. 24, 1901	276	
Tar storage cistern	Dec. 24, 1901	164	
Vessels	April 5, 1899	1,786	
	April 2, 1902	783	
	Jan. 8, 1902	75	
	Jan. 8, 1902	88	
Benzol rectifier	Dec. 11, 1901	260	
		£4,247	11,127
Overhead tar storage cistern	Nov. 27, 1901	690	690
Two gas-producers for tar-still	Aug. 7, 1901	169	169
Tar-tank (No. 2 section)			516
Urinals	Aug. 7, 1901	189	470
Land, Charlestown	Mar. 20, 1901	90	90
Stoves			12,935
Holme Mill	July 6, 1900	4,195	4,195
New roads on works			940
Arching over brook	Sept. 8, 1897	951	1,016
Draining No. 3 works			232
Governor-house and governors	Sept. 8, 1897	338	1,278
Ammonia-house			5,795
Railway waggons	Dec. 6, 1899	£1,900	
	May 30, 1900	153	
	Oct. 10, 1900	75	
	Jan 4, 1899	1,195	
		£3,323	3,171
Meter-house (No. 2 Sec.)			194
Steam-crane	Dec. 7, 1898	£270	270
Shear legs			250
Gates, Bank Bottom	Jan. 22, 1902	£35	20
Exhaust steam			113
Tar-Main			32
Circular staircase	Jan. 12, 1898	34	
Sowerby Bridge District Council for Skircoat and Warley mains	Oct. 3, 1900	£5,000	
	Oct. 30, 1900	4,181	
		£9,181	9,523
Elland Gas Company for mains	Oct. 3, 1900	£1,100	1,100
Retaining wall			2,299
Total		£111,805	£225,484

By the Consolidation of Sinking Funds Act, 1898, there is a saving in the gas-works account, as follows: 1999, £5554; 1900, £5720; 1901, £5893; and 1902, £6069.

DIFFERENTIAL PRICES AT BURSLEM.

At their last Monthly Meeting, the Burslem Town Council had under consideration a recommendation of the Gas Committee (briefly recorded in last week's "JOURNAL") that the price of gas should be reduced to 3s. per 1000 cubic feet, and that discounts of 4d., 3d., and 2d. per 1000 feet, according to the quantity used, should be allowed for prompt payment; the price for prepayment consumers to be reduced to 3s. 3d. per 1000 cubic feet.

Mr. EDMUND LEIGH, in moving the adoption of the minutes containing this recommendation, said there was a slight omission. The price of gas supplied for engines would be reduced to 2s. 6d. per 1000 cubic feet, which was 4d. less than was now charged. Since the principle of differential rating had been adopted, it had been suggested that this course was without precedent. He had been at some trouble to produce a list of 29 towns where differential prices of gas prevailed. In some places, the discounts were 5, 7½, and 10 per cent., and, in exceptional cases, even 15 to 20 per cent. In Birmingham, prices ranged from 2s. 3d. to 2s. 9d. per 1000 feet, with a discount of 5 per cent. The proposed prices included meter-rents, whereas in a neighbouring town where gas was 2s. 8d. per 1000 feet they charged for meters and cookers. The largest consumer—say, a consumer of 100,000 cubic feet a quarter—would get his gas at a slightly cheaper rate than was charged in Hanley. But the other consumers obtained their full equivalent. Meter-rents had been abolished some time ago, at a time when the Committee were receiving about £550 a year in respect of them—this being equivalent to 1d. per 1000 feet. They gave free cookers; and this affected the situation to the

extent of nearly £1000 a year. They were bound to take these matters into consideration. A small consumer of 12,000 cubic feet a year would otherwise have paid in meter-rent 2s. a year, or 2d. per 1000 feet. If he had used a cooker, he would have paid 4s. a year, so that the abolition of these rents meant a total reduction equivalent to 6d. per 1000 feet. Apart from these aspects, the basis of the reduction was absolutely fair; and they ought to make a moderate concession to the consumer of the larger quantity. It had been suggested that they should reduce the price to users of slot meters by 1d. per 1000 feet. When the Committee felt compelled some time ago to raise the price to ordinary consumers by 10d., they only increased the price to the pre-payment consumers 3d. The Committee had put the users of slot meters exactly on the same basis as Hanley; and it might be taken for granted that, if further reductions were warranted, these consumers would have their share. Proportionately, at present, matters were the same as prior to the disturbance of prices some two-and-a-half years ago. He thought that what the Committee were doing for the town in the way of public lighting was not fully recognized by the ratepayers. If the Council could see their way to pay the Committee for the gas they used for street lighting, he might venture to say that the Committee could make another reduction of 4d., and give the town the cheapest gas in the neighbourhood.

Alderman ARROWSMITH seconded the adoption of the minutes.

Mr. CARTLIDGE moved, as an amendment to the recommendation relating to the reduction in price, that the allowance of 2d., 3d., and 4d. should be eliminated from the clause, and that there should be a general allowance of 3d. per 1000 cubic feet all round. He did not wish to find fault with the reduction; but he had seen nothing to make him alter his mind with regard to a distinction being made between the consumers. It was also a mistake to allow the gas-cookers to be put in free. (Mr. LEIGH: Hear, hear.) If the Gas Committee could see their way to impose a small rent for the stoves, it would make things right. Personally, he should be pleased if a sum for the lighting of the public lamps could be paid to the Gas Committee.

Mr. BRINDLEY, who said he entirely disapproved of the principle of differential rating, seconded the amendment.

Mr. LEIGH hoped the Council would not accept the amendment, for if it was adopted it would have the effect of doing a great injustice to the larger consumer. He was in sympathy with Mr. Cartlidge in respect of the gas-cookers, and perhaps the course in regard to them had been adopted rather hastily. He might promise that instructions should be given for special meters to be put in in certain places in order to test the quantity of gas used. He would point out that if the Committee did not dispose of the millions of cubic feet of gas to the factories, the price to the small consumer would be increased; and it was therefore right that they should make some moderate concession to the larger consumer.

The amendment was lost, only three members voting for it.

Mr. MALKIN said he had been trying to find out the real argument which had induced the Committee to make the recommendation; and the strongest one he could discover was that the price they were being offered was being paid in Hanley. The Gas Committee had not considered the matter as they ought to have done. Surely, having regard to the fall in the price of coal, they could have brought the charge for gas down to the old rate of 2s. 9d. per 1000 cubic feet. He moved that the matter be referred back to the Committee.

Mr. CARTLIDGE seconded the amendment.

Mr. WADE thought the Committee's action admitted of ample justification. There was no doubt that the policy of free distribution of cookers and heating-stoves caused an extremely great demand upon the resources of the Committee—a demand quite unforeseen. The increased price of gas caused the rapid development of the works to receive a serious check. In 1897, 152 million feet were produced. This was followed next year by an increase of 11 millions, in the succeeding year by an increase of 13 millions, and the year after by an increase of 22 millions. In the year following that, there was an increase of 11 millions; the consumption reaching the record of 210 million cubic feet in 1901. In 1902, the increase ceased, and there was a decrease of practically 2½ millions. When the increased price had checked consumption, it certainly was only wise to consider a change of policy. There had been a decrease in the price of coal; but this was followed by a decrease in the price of residuals, which more than counterbalanced the advantage gained. It was very patent to the Committee that the wisest and best policy was to bring the reduction of gas to the lowest possible point. They maintained that, in view of the fact that they had free lighting, which was equal to £2900 a year, the time had come when the gas-works should adopt a policy of giving advantage to the consumers, rather than handing over profits to the rates. The Committee proposed to make a substantial reduction now, to be followed by a further reduction. They could not make a larger reduction at the present time, because they were pledged to the Finance Committee for free lighting for the year; but at the end of the financial year the price might be further reduced by 4d. or 5d., which would bring it considerably lower than any other town in the district, and encourage consumption for gas-engines and heating purposes.

The amendment was lost, only the mover and seconder voting for it.

Mr. PORTER referred to the recommendation dealing with the pre-payment consumers. He pointed out that they paid ready money; and he could not see why they should be charged 5d. more than other consumers. He moved that the minute be referred back.

Mr. WILLETT seconded.

Mr. LEIGH said there were reasons why people using slot meters should pay more. The capital expenditure had to be covered, as well as the expense of keeping the meters in repair and of sending a man round with a cart for the money; and if the price were the same, they would have 2000 or 3000 ordinary meters left on their hands. There was only one town where consumers with slot meters paid at the same rate as those with ordinary meters. However, if Mr. Porter would accept the recommendation for the present, he would undertake that the matter should be considered by the Gas Committee at an early meeting.

On this understanding, the amendment was withdrawn, and the minutes were adopted.

FATALITY WITH A FLUELESS GAS-STOVE.

Jury's Strong Verdict.

A sad fatality occurred last Friday week at Kirkgate Railway Station, Wakefield, owing to the use of a bunsen burner gas-stove without a flue being provided. The stove was fixed in the bathroom used by the employees in the refreshment department at the station; and on the night named, two of the girls—Ada Robinson and Mary E. Rhodes—went into the room to have a bath. No suspicion was aroused that anything was wrong until the following morning, when it was found that the girls' beds had not been slept in. The bathroom door was then burst open, and both the young women were discovered lying prostrate on the floor. Rhodes, who was nearest the door, was unconscious, but subsequently recovered; while Robinson had apparently been dead for some hours.

At the inquest on the body of Robinson, which was held on the following Monday, Rhodes stated that while they were engaged in the bathroom, the deceased suddenly said: "I feel bad," and almost immediately fell. Witness also experienced a shortness of breath. They had been in the room about three-quarters-of-an-hour; the window being closed and the door locked. When deceased spoke, witness went to open the door, but was unable to do so, and fell. She remembered nothing more. The burner which warmed the bath was alight; but she could not say how long it had been, or who lighted it. The room felt stifling; and she had noticed it in that condition before. The Manageress said the burner was kept lighted night and day, to supply hot water. It might have been burning for several days without being put out. She had complained to the gas-fitters on several occasions about the smell, and they had cleaned the burner. Dr. Clayton gave it as his opinion that death was due to asphyxia, caused by imperfect combustion of the gas. The circumstance that one girl died and the other remained alive, was due to the fact that Rhodes was in a better position, receiving the benefit of a supply of fresh air from underneath the door. Mr. H. Townsend, the Engineer and Manager of the Wakefield Gas Company, said that though there was a short pipe attached to the burner, there was no flue for the fumes to escape; the pipe being blocked by a stone flag. He had never known such a burner used without a chimney or flue; and the absence of a flue was certainly a source of considerable danger. A gas-fitter in the employ of the Lancashire and Yorkshire Railway Company gave evidence to the effect that he superintended the fixing of the burner some months ago. It was quite new. The room was about 8 feet by 10 feet. He had previously fitted similar burners in lavatories without a flue; but he had never fixed similar apparatus in a bathroom. The flue-hole in the apparatus was meant for use in greenhouses, because if there was no flue it would affect the plants. The Coroner at this stage said he ought to have warned witness that he must not say anything to incriminate himself. "I want to ask you," he continued, "why there was no ventilator provided for the noxious fumes?" Witness: "It was never found necessary. We considered the bye-products were so small that it was not worth taking into consideration." Henry Smith, another gas-fitter, said the burner had been reported to him about three times as requiring attention. On the last occasion, he cleaned it out. He had noticed the outlet on the apparatus, and supposed it was for the fumes. It occurred to him that there should be a chimney to carry the fumes away, but he did not mention it to anybody. He did not think it was dangerous. The Jury, after twenty minutes' consideration, returned the following verdict: "We consider the girl Ada Robinson was asphyxiated through the agency of carbonic acid gas, caused by want of a pipe to carry away the noxious fumes from a probably defective gas-burner, and consider the railway officials to be guilty of gross neglect, almost amounting to criminality."

BERMONDSEY AND ROTHERHITHE PUBLIC LIGHTING.

Cost of Various Systems.

The Bermondsey Borough Council have had before them a report by the General Purposes Committee on the above subject. The Committee have had under consideration an offer made by the South Metropolitan Gas Company to the Council on the question of the public lighting, and also a report thereon by the Borough Engineer (Mr. R. J. Angel, Assoc.M.Inst.C.E.), in which some very interesting comparisons were made of the cost of various systems of street lighting. We have received a print of the *agenda* containing these tabulated particulars, and reproduce them p. 1095. In Bermondsey, to which the figures in Table I. refer, the lamps are lighted, extinguished, cleaned, and maintained by the Council's workmen; and the gas is paid for on the average meter system (one meter to every ten lamps). The Committee propose to provide a large sum in the estimates next year for the extension of incandescent lighting in the district. The figures in Table II. refer to the parishes of Rotherhithe and St. Olave. In the former the Gas Company maintain the whole of the lamps; in the latter, the incandescent lamps only—the flat-flame burners being lighted by the Council's workmen, and the gas charged on the number of hours' lighting. The prices quoted by the Company stand till February, 1904, and are based upon gas at 2s. 2d. per 1000 cubic feet, less 5 per cent. The estimate for the Council's maintenance is based upon gas at 2s. 3d., less 5 per cent., and is, of course, subject to a rise or fall in price. The cost of the No. 2 Kern burners and of altering the lanterns and frog irons is given as about 20s. each, and of the No. 3 and No. 4 burners as about 23s. each. The Committee recommended that incandescent burners should be extended in St. Olave's and Rotherhithe, and that the work should be carried out by direct labour. They wished the Council to refer the matter to them, with the view of arranging terms with the Gas Company for the purchase of burners, &c., by deferred payments; the Council to pay the same price for gas as at present, until the cost of the burners and the alteration of the lanterns has been liquidated.

TABLE I.—*Bermondsey Parish.*

—	5-Feet Borrodaile's Flat-Flame Burners.	7-Feet Siemens Flat-Flame Burners.	Incandescent "C" Burners (now Obsolete).	No. 2 Kern Burners	No. 3 Kern Burners.	No. 4 Kern Burners.	Sugg's High-Pressure Gas-Burners.	Electric Light.	
								Arc until Midnight, then Incandescent to one Hour before Sunrise.	
Gas consumed per annum . . .	18,827 c. ft.	25,600 c. ft.	13,675 c. ft.	11,176 c. ft.	12,100 c. ft.	15,000 c. ft.	Estimated at 40,000 c. ft.		
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	Arc. £ s. d.	Incandescent. £ s. d.
Gas at 2s. 3d., less 5 p.c. . . .	2 0 2½	2 14 9	1 9 3	1 3 11	1 5 10	1 12 4	4 5 6	9 14 0	4 3 0
Mantles	..	..	0 4 0	0 3 9	0 3 4	0 5 5			
Chimneys and globes	..	..	0 1 0	0 1 0	0 1 0	0 1 0			
Glass tinware to lanterns . . .	0 1 1	0 1 1	0 1 1	0 1 1	0 1 1	0 1 1	2 10 0	5 17 0	0 6 0
Labour, lighting, cleaning, &c. .	0 12 8½	0 12 8½	0 15 0½	0 15 0½	0 15 0½	0 15 0½			
Painting once in two years. . .	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0			
	2 15 0	3 9 6½	2 11 4½	2 5 9½	2 7 3½	2 15 10½	6 15 6	15 11 0	4 9 0
Gas Company's prices	3 0 7	..	..	2 7 6	2 15 1½	3 2 8½	..	..	..
Candle power.	13 to 14	19 to 21	60	40 to 50	65 to 75	80 to 100	300 to 350	1200	Two 32 c.p. = 64.
Cost per do. per annum . . .	4s. 0¾d.	3s. 5¾d.	10¼d.	1s. 0¼d.	8d.	7¼d.	5d.	3½d.	1s. 4¾d.

TABLE II.—*St. Olave's and Rotherhithe.*

—	Present Cost.				Estimated Cost if Incandescent Burners are Used and Maintained by the Council.			Price Charged by the Gas Company for Incandescent Burners if Used practically throughout the District.		
	Maintained by Council.	Maintained by Gas Company.								
	5-Feet Flat-Flame.	5-Feet Flat Flame.	No. 2 Kern.	No. 3 Kern.	No. 2 Kern.	No. 3 Kern.	No. 4 Kern.	No. 2 Kern.	No. 3 Kern.	No. 4 Kern.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Gas	2 6 0				1 5 2	1 14 0	2 0 4½			
Labour	0 12 8½	3 0 7	2 9 5	2 18 5	0 15 0½	0 15 0½	0 15 0½	2 7 6	2 15 1	3 2 8½
Sundries, as per Bermondsey account	0 2 1				0 6 10	0 6 5	0 8 6			
	3 0 9½	3 0 7	2 9 5	2 18 5	2 7 0½	2 15 5½	3 3 11	2 7 6	2 15 1	3 2 8½
Candle power	13 to 14	13 to 14	40 to 50	65 to 75	40 to 50	65 to 75	80 to 100	40 to 50	65 to 75	80 to 100
Cost per candle power per annum. .	4s. 0¾d.	4s. 0¾d.	1s. 1¼d.	10d.	1s. 0¼d.	9½d.	8¼d.	1s. 0¾d.	9½d.	8¼d.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1076.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.	£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	19—20*	..	5 5 0	851,070	10	Oct. 15	7	River Plate Ord. . .	9¾—10¼*	..	6 16 7
100,000	10	,,	7½	Do. 7 p.c.	12½—13½*	..	5 11 1	300,000	Stk.	June 24	4	Do. 4 p.c. Deb..	93—96	..	4 3 4
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102	..	4 18 0	250,000	10	Sept. 26	8	San Paulo, Ltd.. . .	11⅞—12⅛	..	6 8 0
200,000	5	May 14	6½	Bombay, Ltd. . . .	6—6⅛	..	5 0 0	135,000	Stk.	Sept. 11	10	Sheffield A	236—238	..	4 4 0
40,000	5	,,	6½	Do. New, £4 paid	4¼—4⅝	..	5 9 5	209,984	,,	,,	10	Do. B	236—238	..	4 4 0
380,000	Stk.	Aug. 14	12	Brentford Consolidated	249—254	..	4 14 6	523,498	,,	,,	10	Do. C	236—238	..	4 4 0
270,000	,,	,,	9	Do. New . . .	182—187	−2	4 16 3	6,000,000	Stk.	Aug. 14	5⅓	South Met., 4 p.c. Ord.	122—124	..	4 6 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11	1,700,000	,,	July 11	3	Do. 3 p.c. Deb. . .	91—93	..	3 4 6
206,250	,,	June 12	4	Do. 4 p.c. Deb. .	111—114	..	3 10 2	380,940	Stk.	May 14	5	Southampton Ord. . .	102—106	..	4 11 4
220,000	Stk.	Sept. 11	10⅔	Brighton & Hove Orig.	207—212	..	5 1 5	87,950	,,	July 11	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
246,320	,,	,,	7⅛	Do. A. Ord. Stk. .	152—157	..	4 18 9					Tottenham and Edmonton A. 5 p.c. B. 3½ p.c.	118—123	..	4 17 7
460,000	20	Sept. 26	10	British.	39—40*	..	5 0 0	120,000	Stk.	Aug. 28	6		93—98	..	4 11 10
50,000	10	Aug. 14	12	Bromley, Ord. 10 p.c. .	22—24	..	5 0 0	300,520	,,	,,	4½				
82,850	10	,,	9	Do. 7 p.c. . . .	18—20	..	4 10 0	182,380	10	Jan. 16	5	Tuscan, Ltd.. . . .	7—8	..	6 5 0
500,000	10	Oct 15	7	Buenos Ayres (New) Ltd.	10—10¼*	..	6 13 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
250,000	Stk.	June 24	4	Do. 4 p.c. Deb.	93—95	..	4 4 3	230,000	5	Aug. 14	9½	West Ham, 10 p.c. . .	10—11	..	4 6 4
150,000	20	July 11	8½	Cagliari, Ltd. . . .	21—23	..	7 3 6	172,000	10	,,	6½	Do. 7 p.c. . .	13½—14½	..	4 9 8
100,000	10	Sept. 26	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0								
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	54—56	..	5 7 2								
550,000	Stk.	Oct. 15	12½	Commercial Old Stock	260—265*	−1½	4 14 4								
251,875	,,	,,	9½	Do. New do. .	200—205*	−¼	4 12 8								
271,875	,,	June 12	4½	Do. 4½ p.c. Deb.	130—134	..	3 7 2								
800,000	Stk.	May 28	9	Continental Union, Ltd.	138—143	..	6 5 10					WATER COMPANIES.			
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	−2½	4 16 7								
575,000	Stk.	Aug. 28	5⅛	Crystal Palace Ord. 5 p.c.	118—123	..	4 6 8	780,599	Stk.	June 24	11½	Chelsea, Ord. . .	300—310	..	3 14 2
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0	150,000	,,	,,	5	Do. 5 p.c. Pref. .	152—157	..	3 3 8
106,158	,,	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	..	3 10 5	160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—143	..	3 2 11
486,090	10	July 30	10½	European, Ltd. . . .	17⅛—18⅛	..	5 13 6	175,785	,,	Sept. 26	4½	Do. 4½ p.c. Deb. .	137—142	..	3 3 5
354,060	10	,,	10⅓	Do. £7 10s. paid	13—14	..	5 12 6	1,720,560	Stk.	Oct. 15	8	East London, Ord.. .	211—216*	−4	3 14 1
15,243,200	Stk.	Aug. 14	4	Gas-light and Coke	4 p.c. Ord. . .	89—91	+1	4 7 11	654,740	,,	June 12	4½	Do. 4½ p.c. Deb. .	142—147	..	3 1 3
2,600,000	,,	,,	3⅛		3½ p.c. max. .	88—90	..	3 17 9	1,282,943	,,	,,	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7
3,799,735	,,	,,	4		4 p.c. Con. Pref.	107—109	..	3 13 5	700,000	50		8	Grand Junction 10 p.c. max..	110—115	..	3 9 7
4,193,975	,,	June 12	3		3 p.c. Con. Deb.	92—94	..	3 3 10	310,000	Stk.	Sept. 26	4		125—130	..	3 1 7
70,000	10	Nov. 13	8	Hongkong & China, Ltd.		14½—15½	+½	5 3 3	708,000	Stk.	Aug. 14	14	Kent	285—295	..	4 14 11
3,800,000	Stk.	May 14	10	Imperial Continental .		205—207	..	4 16 7	160,000	,,	,,	7	Do. New, 7 p.c. max..	195—205	..	3 8 4
473,600	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.		98—100	..	3 10 0	1,043,800	100	June 24	11	Lambeth, 10 p.c. max..	290—300	..	3 13 4
561,000	Stk.	Aug. 28	10	Liverpool United A .		227—229	..	4 7 4	406,200	100	,,	8½	Do. 7½ p.c. max..	210—220	..	3 17 3
718,100	,,	,,	7	Do. do. B .		165—167	..	4 3 10	350,000	Stk.	Sept. 26	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
306,083	,,	June 24	4	Do. do. Deb. Stk.		116—118	..	3 7 10	500,000	100	Aug. 14	12⅝	New River, New Shares	385—395	..	3 4 9
75,000	5	June 12	5	Malta & Medn., Ltd. .		4¼—4⅝	..	5 5 3	1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.		104—108	..	4 12 7	902,300	Stk.	June 12	7	South-wark and Vauxhall Ord. . . . 7½ p.c. max. 5 p.c. Pref. . 4 p.c. A Deb.	180—185	..	3 15 8
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.		102—104	..	4 6 7	126,500	100	,,	7		152—157	..	3 3 8
541,920	20	June 12	5½	Monte Video, Ltd. . .		9—10	..	7 0 0	489,200	Stk.	,,	5		123—128*	..	3 2 6
1,315,892	Stk.	Aug. 8	4½	Newc'tle & G'tesh'd Con.		104—105	..	4 5 9	1,019,585	,,	Oct. 15	4		270—280	−5	3 11 5
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.		99—100	..	3 10 0	1,155,066	Stk.	June 12	10	West Middlesex. . .	139—144	..	3 2 6
300,000	Stk.	—	8	Oriental, Ltd. . . .		—	..	—	200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	95—97	..	3 1 10
60,000	5	Sept. 26	7	Ottoman, Ltd. . . .		6—6½		5 7 8	200,000	,,	Sept. 11	3	Do. 3 p.c. Deb. .			

* Ex div.

ELECTRIC LIGHTING NOTES.

The Sudbury Town Council Transfer their Order.

At a recent special meeting, the Sudbury Town Council decided to transfer their Electric Lighting Order to Mr. Adrian Collins, of London. He agrees to carry out all the conditions stipulated in the Order, and will undertake that the charges for current shall not exceed 7d. per Board of Trade unit for lighting purposes, and 3d. per unit for motive power. It is his intention to form a local company to carry out the work, and he will give preference to the residents of Sudbury to subscribe the necessary capital, should they so desire. The decision was come to on a report presented by the Electric Light Committee, which was adopted without discussion; "the Council apparently considering," remarks a local paper, "this the least unpleasant way of escape from an awkward situation."

A Painful Surprise at Elland.

The following very eloquent paragraph regarding Elland, taken rom a local paper, will doubtless cause amusement to our readers: Considerable surprise has been occasioned by a recent decision of the Town Hall Directors to have the Town Hall equipped throughout with incandescent gas-lamps. The District Council had naturally entertained hopes that, inasmuch as the electric lighting installation completion is now only a question of a few months, the Directors would see their way to have their spacious premises lighted with the modern light. But Mr. Robert Porter, the Engineer and Manager to the Elland-cum-Greetland Gas Company, has offered most advantageous terms, and guarantees with a new incandescent, which has just been brought out, to effectively light the hall at a considerably less rate than has hitherto been the case. We have seen the appliance. It is called the new "Elektra" incandescent gas-lamp; and the Elland Gas Company were the first in England to obtain the new arrangement. If partiality for this modern lamp continues, it would appear that there is a bad look-out for electricity.

Electric Lighting Burdens the Rates at Redditch.

At a special meeting of the Reddich Urban District Council on Wednesday, the Clerk presented the estimates for the ensuing year. The total expenditure was put at £5297, the revenue at £1077; leaving a balance of £4220, to meet which a general district rate of 2s. 3d. in the pound was required. The Chairman (Mr. W. Woodfield) formally moved the adoption of the estimates and the sealing of the rate. This was seconded by the Vice-Chairman (Mr. A. Townsend). As an amendment, Mr. W. Gibbs moved that a rate of 2s. 1d. for the half year be levied. Mr. Johnson, in seconding this, remarked that altogether the electric light undertaking was running them into an annual loss of £2420. A long discussion ensued, the Chairman and Clerk saying they could not see how any reduction of the estimate was possible. Mr. J. Warner, the Chairman of the Lighting Committee, protested against a reduction of the rates below 2s. 3d., and defended the electric light undertaking. He criticized what he described as the extraordinary statement of Mr. Johnson that the concern was costing the ratepayers £2420 a year, and pointed out that the estimates only showed that it made a demand upon the rates of £1000 a year, while it paid back £1084. Mr. Johnson maintained that the undertaking had increased the town's indebtedness by £20,000, and added 1s. in the pound to the rates. If something was not done to check the rapidly increasing outlay in this direction, the rates would be run up to 6s. in the pound. Mr. Gross said everything had to be robbed to keep the electric light going. The roads had to be patched instead of being properly made; everything must go for the electric light. In the result, the proposition for a 2s. 3d. rate was carried by a large majority.

Electricity Supply and the Rates at Aldershot.

The question of electric *versus* incandescent gas lighting has lately been discussed in the columns of the "Aldershot Gazette," in view of the fact that the Aldershot District Council have already plunged into an expensive scheme of electric lighting. The writer of the article cites the cases of Liverpool and Manchester in support of his contention that the applicability and success of the incandescent gas system minimize very considerably the value of electricity as an illuminating agent for public lighting. He very pointedly asks: "If in cities like Liverpool and Manchester electric lighting of the streets is found to be costly and something of a failure, how can it be expected that it will become remunerative and a success in such a town as Aldershot?" This is a very pertinent question, and one which the ratepayers would do well to consider. The writer goes on to state that the Lighting Committee of the Council have spent the £20,000 for which they asked, and it is now suggested to further extend the works, and, of course, add to the loan. But what proof can be offered that the extension will be a commercial success? Looking at the fact that there has already been a demand upon the local rate for £1300 for the deficiency on the working of the electric light station, even after full allowance has been made for the saving in gas, it would surely be well that the Council should hesitate before launching into further outlay in this direction. It does not appear that the extension of cables into the outlying residential parts of the town is likely to bring a remunerative return for the necessary outlay upon them and what must inevitably follow—the provision of new plant—but rather that the loss on the undertaking will be increased. The writer, therefore, throws out the suggestion that the Committee and the Council should pause before proceeding further—a suggestion in which we cordially join.

Fighting Electricity at the Cape.

If the ratepayers of Port Elizabeth bring upon themselves financial burdens as the result of adopting electricity for the public lighting, it will not be the fault of Mr. William Arnott, the Manager of the gas-works in that town, which belong to the South African Lighting Association. The Editor of one of the local papers complained of the "ill-

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	YORK	750,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	ROCHESTER	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	KINGSTON, ONT.	300,000
COLCHESTER	300,000	CRYSTAL PALACE DISTRICT	2,000,000
BIRKENHEAD.	2,250,000	DULUTH, MINN.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CATERHAM	150,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	LEICESTER	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	ENSCHEDE (HOLLAND)	150,000
HALIFAX	1,000,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
TORONTO	250,000	BURNLEY	1,500,000
OTTAWA	250,000	KINGSTON-ON-THAMES	1,750,000
LINDSAY (Remodelled)	125,000	ACCRINGTON	500,000
MONTREAL	500,000	TONBRIDGE	300,000
TORONTO (Second Contract; Remodelled)	2,000,000	STRETFORD	500,000
BELLEVILLE	250,000	OLDBURY	300,000
OTTAWA (Second Contract)	250,000	TODMORDEN	500,000
BRANTFORD (Remodelled)	200,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
ST. CATHERINES (Remodelled)	250,000	YORK (Second Contract)	750,000
KINGSTON, PA.	125,000	ROCHESTER (Second Contract)	500,000
PETERBOROUGH, ONT.	250,000	NEWPORT (MON.)	250,000
WILKESBARRE, PA.	750,000	TOKIO, JAPAN.	1,000,000
ST. CATHERINES (Second Contract)	250,000	PERNAMBUCO (Brazil)	125,000
BUFFALO, N.Y.	2,000,000	MALTON	150,000
WINNIPEG, MAN.	500,000	DULUTH, MINN. (Second Contract)	300,000
COLCHESTER (Second Contract)	300,000	BROCKVILLE (ONT.)	250,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.), 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft. TORONTO (3rd Cont.), 750,000 C. Ft.

lighted" streets, which, he said, would "disgrace a moderate-sized English village." Of course, the writer was desirous of seeing a change of illuminant; and this naturally roused Mr. Arnott, who directed his attention to the results shown in the last Board of Trade returns in regard to the supply of electricity. The sapient Editor seemed to be labouring under the impression that an electric light installation would allow of the public lighting being done free of cost to the ratepayers; but Mr. Arnott gave him a little information on this point which must have quickly dispelled any such delusion. When out of 126 municipal electric light undertakings there is a loss on 50, the business does not look like a very profitable one for the ratepayers. But without going to the Old Country for his weapons of defence, Mr. Arnott referred to a case close at his doors. Pointing to the electric lighting of Cape Town, he characterized it as a "huge farce." One or two of the principal streets are well lit with arc lamps; but the rest have small incandescent lamps of which it takes four to equal one incandescent gas-burner in power. The result is that a few yards from the lamp-post it is impossible to see. Mr. Arnott contrasts this with the new incandescent gas-lights in Main Street in his town, which cannot be equalled for steadiness, illuminating effect, and economy by any system of electric lighting. It would cost four times the present price of gas to light Port Elizabeth by electricity, and produce the same effect as now. How, then, are the ratepayers going to get their streets lighted free? The thing is absurd. Mr. Arnott says it is a "pretty dream," but it vanishes before the "daylight of facts."

Vagaries of Meter Registration at Taunton.

A controversy of some interest has arisen in Taunton respecting the manner in which the Corporation charge for electric light. At a meeting of the Town Council last week, the Electric Lighting Committee presented a report on the subject, in which they stated that difficulties had arisen in consequence of the Borough Electrician having refused to listen to attempts to intimidate made on behalf of a former workman at the depôt, whose services had been dispensed with. Alderman Potter, the Chairman of the Committee, said the charge brought against the above-named official was that he had been in the habit of charging many of the consumers for more current than was supplied to them, by putting on their meter readings, and that the workman who was required to do this had conscientious objections, and had in consequence been discharged from the service of the Corporation. The Committee felt that so serious a charge affected them as well as the Electrician, and it was accordingly inquired into, with the result that they came to the conclusion that it was absolutely groundless. Mr. Potter went on to explain that in charging for current the system adopted was to examine the meters, and if there was a suspicion that any had worked too fast or too slow, they were tested, and proportionate deductions or increases made. If, as was sometimes the case, the meter ceased working altogether, they charged for the current according to the average used during the corresponding period of previous years. No meter, however, was interfered with, unless there was such a variation in the monthly reading as would suggest that there was something wrong with it. The present system of charging by the Corporation was the same as that in use in most other towns. If a better one could be found, they were prepared to adopt it. It had been decided that in future, when any meter was interfered with, the consumer should be informed of it, and could, if he desired, be present at the testing, and be told the result at once. An agreement would also be entered into between the consumer and the Corporation which would prevent the possibility of misunderstanding. It was not true that the workman had been discharged because he objected to altering the meters, but because the staff had to be reduced owing to the Committee being prevented from hiring out appliances and carrying on installation work. The Council unanimously expressed confidence in the Committee by adopting their report. The incident will, however, not tend to increase public confidence in a measuring instrument which would appear, in quite an appreciable number of cases, to require adjustment by reference to averages.

HUDDERSFIELD CORPORATION WATER SUPPLY.

The Defective Reservoir.

At the Meeting of the Huddersfield Town Council last Wednesday, the minutes presented by the General Purposes Committee contained a reference to the position of the water-works question, about which there has been considerable dissatisfaction. The Water Committee had had an interview with Messrs. C. Hawksley and G. H. Crowther, the Engineers for the construction of the Butterley and Blakeley reservoirs, with reference to the advisability of obtaining independent expert advice in regard to the condition of affairs at the Butterley and Blakeley works, and a fresh agreement with them on the footing of a definite time and a fixed sum for their services for the completion of the works. To the first, the Engineers had no objection; but they declined to enter into a new agreement regarding further work at the reservoirs mentioned, as they were included in the agreement between the parties. They were, however, willing to make a rebate on the commission as to remedial works. When the matter came before a meeting of the General Purposes Committee, dissatisfaction was expressed at the long delay in the completion of the works and the serious excess of expenditure over the estimate, and it was determined to retain some eminent hydraulic engineer to report on the condition of things at the two reservoirs. The Water-Works Construction Sub-Committee were also authorized to determine and put an end to the engagement of the Engineers, and to appoint an engineer or engineers for the purpose of completing the works in progress, and to act as they might think best in the interests of the Corporation. The total amount spent on the Butterley reservoir up to September last was £300,001, and on the Blakeley reservoir £79,125. On the minutes coming up for confirmation, they were adopted.

Wright's "Eureka" Gas-Fires.

Artistic in Design

Perfect in Construction.

Reasonable in Price.

NEW WATER-WORKS FOR CINCINNATI.

We learn from the "Engineering Record" that the new water-works for the supply of Cincinnati are making good progress. From a description of them contained in a recent issue of our contemporary, we take the following particulars.

The new works include an intake pier on the Kentucky shore of the Ohio River opposite California; an intake tunnel under the river to the foot of a shaft running down from a large pump pit sunk to such a depth that water will reach the pumps by gravity; large subsiding reservoirs to which these pumps will force the water for partial clarification by subsidence; a filtering plant with a clear-water reservoir, and a tunnel upwards of four miles long, running to the city, where another pumping-station will be constructed to force the water to the tanks and reservoir of the distributing works. The masonry intake pier, in water about 90 feet deep at the high stage, was built on a pneumatic caisson about 58½ feet long, 30½ feet wide and 16 feet high. It had 4-feet timber walls, braced by two lines of longitudinal struts and tie-rods, and five similar transverse lines, and an 8 feet timber deck. The caisson was sunk to solid rock, at one corner through 16 feet of decomposed limestone and shale rock. From the bottom a shaft was excavated about 35 feet deep under air pressure, lined with vitrified brick, and a short section of the intake tunnel to the Ohio shore was driven and similarly lined under pneumatic pressure. Afterwards most of the tunnel was built without air pressure; but when seamy rock was encountered, an air-lock at the top of the shaft was closed, and the work was carried on under air pressure throughout. The tunnel has a circular cross-section 7 feet in diameter, lined with two rows of brick with concrete filling to the rock outside. It is 1425 feet long, and the invert is from 50 to 75 feet below the river bottom and about 30 feet below the surface of the rock. The centre line was produced from the bottoms of plumb lines upwards of 80 feet long; but the two headings started from the bottoms of the intake and pump-well shafts met with only ⅝-inch eccentricity.

In constructing the pump well of the California pumping-station, a pit 16 feet deep and about 140 feet in diameter at the bottom was first excavated, with steep sloping unbraced sides in the clay and loam. The bottom was carefully levelled, and a ditch was dug around its circumference connecting with a big open drain cut through the bank on one side of the river. The pit was made as deep as the contractors dared go for fear of trouble with ground water; and in it a timber caisson, about 127 feet in diameter and 20 feet high, was built. Four transverse and four longitudinal solid timber walls 3 feet thick and 7 feet high were constructed at the bottom of the pit, dividing the caisson into 21 working chambers connected by openings through the bulkheads. Then the circular steel cutting edge, 24 inches deep with an 8 in. by 8 in. bottom flange angle, was riveted in place around the cross walls and just beyond their outer ends. The first course of roof timbers was laid on top of the walls, and inclined timber staves forming the inside of the conical side wall were fitted between the bevelled edge of this course and the inside flange of the cutting edge. Horizontal annular timbers of triangular cross section were cut with a band-saw, and bolted to the upper surface of the staves, to form offsets on which the packing courses were built up to the top of the working chamber, and above it a solid roof of crossed timber was built up to a height of 12 feet, forming a deck or pump floor 20 feet above the cutting edge. The ceilings of the working chambers and the sides of the bulkheads were sheathed, and all the outside and inside joints cleaned with compressed air and caulked. Before putting on the sheathing, all the joints covered by it were caulked. The caisson was finally landed in a stratum of sand, and the working chambers were back-filled with moist sand rammed in 4-inch layers.

During the sinking of the caisson, the central shaft was used exclusively for men; but when the excavation was continued below the caisson, it was used for both men and materials, and was fitted with a combination air-lock of larger diameter than the shaft, and eccentric with it, which had a doubled-leaved 3 ft. by 6 ft. top door through which the spoil car was hoisted in a cage, and a separate chamber and door for the men. After the excavation was completed, the shaft was lined with brick up to the top of the caisson deck, the air pressure was released, and the tunnel heading starting from the bottom of the shaft. While the caisson was being sunk and the tunnel was being excavated, the four 48-inch branches just above the caisson deck were closed by timber diaphragms, bolted to their flanges, over lead gaskets. After the shaft was completed, the upper part of its steel lining was continued to a height of 127 ft. 6 in. above the deck of the caisson; the diameter for the last 12 feet being reduced to 6 feet, so as to project above a rotating electric crane, the inner end of which will rest on top of the 10-feet part of the shaft, and the outer end on the wall of the house to be built over the pump-pit. The tie-rods of the roof of this house will be attached to the top of the 6-feet part of the shaft.

The four 30 million gallon pumping-engines to be installed in this pit are now in course of construction. They are of the triple-expansion crank and fly-wheel type, and will be supplied with steam at 150 lbs. pressure. Their maximum lift will be about 143 ft. 6 in., *plus* the friction head in the force-mains, which are two in number, each 5 feet in diameter. Near the pumping-station there will be a cross connection between the mains, provided with a 5-feet valve, and a 5-feet stop-valve in each main. These valves are situated above the cross connection, and the necessary blow-offs, air-valves, and manholes are provided for draining and obtaining access to the mains above and below them.

The two settling tanks have a combined capacity of about 350 million gallons, and are partly in excavation and partly in embankment. The two force mains terminate at a receiving basin between the reservoirs, where each pipe ends in a quarter bend with its upright portion splayed outward somewhat to form a slight bell. From the receiving basin, which is 15 feet long, 25 feet wide, and nearly 17 feet deep, the water passes into a masonry channel 70 feet long, 25 feet wide, and from 10 to 10½ feet deep, having a measuring weir at the lower end. On each

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side of the channel, about one-third of its length from the lower end, is a recess which will be fitted with boxes for hook gauges. These boxes are connected with a 2-inch bronze pipe laid down the centre of the channel to serve as a piezometer tube. The masonry channel at the end has a cast-iron frame filled with bronze strips forming the weir proper, over which the water will flow to the distributing basin, 22½ feet long, 25 feet wide, and 14 ft. 9 in. deep; its end being semicircular in plan. At the upper end of the receiving basin there is a valve chamber containing five 5-feet valves and cross connections between the force mains and with the bye-passes around the weir. The water is taken from the distributing basin through two lines of 6-feet pipe (one to each reservoir) which are carried through the tops of the embankments of the reservoirs to the receiving chambers on the inner slopes. From each chamber there is a channel and cascade built of masonry and 18 feet wide, down which the water rolls to the basin.

The embankments or dams across the main natural ravines which have been utilized for forming the reservoirs will have a uniform width of 30 feet on the top, and an inside slope of 1 in 3, an outside slope of 1 in 1¾, and "bermes" 30 feet wide and 12 feet below the water level on their outside slopes. The earth is spread and rolled in 4-inch layers with careful attention to all the features which will influence the tightness and homogeneity of the bank No core is employed, on account of the plan of construction of the reservoirs, whereby the whole of the masonry part of the revetment is underlaid by a blanket of rolled selected material, which is especially thick in the parts contiguous to the dams, which makes such a detail unnecessary. The low water-line in the reservoir is 110 feet above the datum of the work; and a foot lower, at 109 feet, is the contour which marks the change in the inner slopes. Above 109 feet, the slope is everywhere 1 in 3; but below that it varies considerably. The character of the lining is also changed at this elevation. Above it, the excavation is carried to a depth of 2 feet, measured perpendicularly to the slope; while below, it is carried to a depth of 3 feet lower than the surface of the finished grading. The areas thus excavated are consolidated by rolling and ramming, and then refilled in the same manner as the embankments are constructed. Above elevation 109, the bottom layer of broken stone is laid first, a layer of concrete is next placed on the stone, then asphalte and burlap, finally a brick pavement. Below this elevation, the bottom layer of crushed stone is omitted. Where used, it is 12 inches thick.

The concrete is to be a 6-inch bed, made with portland cement and 1-inch stone, and will be given a step near elevation 109 to support the broken stone. It will be painted with a priming coat of Alcatraz asphalte dissolved in benzine, and then immediately swabbed with a mixture of the best refined Bermudez lake asphalte and "F" grade liquid Alcatraz asphalte, or its equivalent. While the mixture is still hot, it will be covered with a layer of coarse burlap, held at the top by ¾-inch bars laid on the concrete against the upper edge of the brickwork. A second coat of the asphalte mixture, at least ⅛ inch thick, will be applied to the burlap. The bricks forming the surface will be laid flat. They will be warmed before laying, and a wash of the asphalte priming will be laid on the surface of the slope just before the bricks are placed on it. Portland cement grout will be used for the joints. At the top of the slope there will be a curb of sandstone.

The water will be taken from each reservoir through two floating pipes of riveted steel, 4 feet in diameter, connected by swivel joints with the tops of two 5-feet effluent pipes, which rise vertically in the masonry pier supporting the floating arms. This pier also forms the bulkhead of the 16-feet masonry gallery within which the outlet pipes are carried through the earthwork to a shaft on the outer slope. The pipes rise in this shaft, and are finally connected with two lines of 5-feet pipes laid on the 30-feet "berme" of the outside slope of the embankment, and leading to the coagulating basin. The drain pipe in the bottom of the masonry culvert has a special mud-valve at its inlet, which is operated by water from pipes laid round the top of each reservoir to supply the numerous hydrants. These pipes are 8 inches in diameter, and will be supplied by a force-pump.

About 1400 feet of the tunnel running from the purification works to the Western pumping-station in Cincinnati have now been driven, and the lining completed for about 900 feet. The shaft at the California end is about 167 feet deep below the natural ground surface, and consists of a 12-feet steel shell down to the rock and a 12 ft. 6 in. shaft the rest of the way. Both shell and rock shaft are lined with concrete and two rings of shale brick, the clear diameter being 10 feet. At two different elevations nozzles have been placed. One of these nozzles connects with the pipes through which water will be admitted to the shaft from the clear-water reservoir, and the other with a canal passing around the clear-water basin, and enabling it to be put out of service in case of emergency. The shell will be carried up to a height of 8 feet above the level of the water in the clear well; but the brick lining will stop 6 feet below its top. The tunnel running from the foot of the California shaft to the foot of one of similar construction at the Western pumping-station, will be about 22,700 feet long. There are three intermediate working shafts along its line, and operations are now being carried on at one shaft under compressed air, and in the open at the others. The excavation is being kept as close to a 9 ft. 6 in. circle as possible; and the lining will be concrete and two rings of shale brick with a fire-glazed surface for the part forming the surface of the tunnel. The conduit will have a grade of 1 in 2000 towards the pumping-station shaft, and will deliver water to the pumps by gravity; thus avoiding any suction lift here as well as at California. The construction of the tunnel has not offered any serious difficulties yet; but it is possible that there may be some trouble in crossing below the bed of the Little Miami River. At this place it is proposed to hoop the brickwork with ¾-inch steel rods spaced 2 feet apart. The steel shell of the shaft at the west end of the tunnel will be carried about 90 feet above ground; but the nozzles of the suction-pipes of the pumps will be attached 93 feet below its top. There will be two sets of three pumps each. The pumps of one set will have a capacity of 25 million gallons each, while those in the other set are to be of 12 million gallons capacity—all of vertical triple-expansion type.

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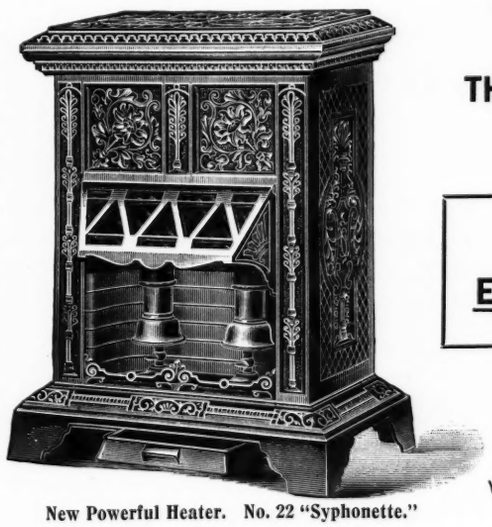

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Arbroath Town Council had before them on Monday a minute of the Gas and Electric Light Committee, which stated that they had considered a report by the Manager—Mr. A. C. Young—drawing attention to the comparatively high price of cannel and shale, and the endeavour which has been made to obtain a substitute that would allow of enrichment without incurring the expense of using cannel coal. He further reported that he had had considerable experience in the manufacture of oil gas for enriching purposes; but, having regard to the present price of the oil required for the purpose, the cost of erecting the necessary plant, and other circumstances, he had come to the conclusion that the economy to be effected would not warrant the adoption of the Peebles oil process at the present time. Certain elements in the tar produced at the works, however, gave a gas of high illuminating power, and part of the economy gained by the adoption of the new carbonizing plant is owing to some of this tar being made into a permanent gas. Benzol is now being used in various works for enrichment, and, in particular, plant has been laid down for the purpose in Perth, Dunfermline, Alloa, and other places. It appeared to the Manager that, by means of this process, the gas produced at the works might be enriched to the extent of at least two candles very economically. His calculations were made on the basis of the price on which he could contract for the supply of benzol for three years; and if the price of this article should rise, there would be a corresponding increase in the price of the crude naphtha sold from the works, so that financially the result would not be greatly different. From exhaustive calculations he had made, the Manager stated that, taking 20-candle gas as the standard, the cost of enrichment by means of cannel coal would be 13s. 3d. per ton, by shale coal 13s. per ton, and by benzol and shale 12s. 4d. per ton. Assuming that 7500 tons of coal were used annually, there would thus be a saving of £250 per annum by using the benzol. He therefore recommended for the consideration of the Committee the laying down of the necessary plant—a Maxim-Clark carburettor—the estimated cost being £250, which would include the cost of a building to enclose it. The Committee, after disoussing the Manager's report, and hearing explanations by him, and considering that the economy anticipated by Mr. Young from the new plant laid down last summer, of not less than £500 per annum, was being realized, and that the new works erected by Mr. Young had been completed in a highly satisfactory manner, and were giving excellent results, unanimously agreed to recommend the Council to lay down the proposed new plant suggested by the Manager, at a cost of £250, and to authorize the work to be at once proceeded with. The Town Council agreed to this. The Committee also recommended, on the suggestion of Mr. Young, that gas-fittings should be inspected, when asked, by the Corporation's fitters, and that, if new burners were required, they should be supplied free of charge.

The Watching and Lighting Committee of the Aberdeen Town Council have had before them this week reports by Mr. J. A. Bell, the Electrical Engineer, and Mr. Lewis Anderson, the Lighting Inspector, as to the cost of lighting a number of the streets of the city in which there are electric car routes by electricity and by incandescent gas-lamps. Mr. Bell stated in his report that there are at present 596 gas-lamps in the thoroughfares referred to, and the number of electric arc lamps proposed was 229. The capital outlay in installing the arc lamps would be £6 11s. 3d. each. The cost of lighting by gas at present is £1009, and the cost by electricity would be £3951—an annual increase of £2942. Mr. Anderson stated the cost of converting the existing gas-lamps into incandescent lamps at £850; and the annual cost, if 3½ cubic feet of gas per hour were consumed, at £1167, and if 7 cubic feet per hour were consumed, at £2024. The Committee agreed to recommend the Council to have two thoroughfares lighted by electricity, and that the question of the lighting of the other streets should be deferred.

The Sheriff of Dumfriesshire has given his sanction to the erection of the new gasholder which the Corporation have resolved to add to the gas-works. On account of complaints as to the defective supply of gas, the Corporation are about to enlarge mains, at a cost of £132. At a meeting of the Corporation the other night, Mr. Thomson entered upon an interesting comparison of the cost of gas and electricity for lighting. Taking an official statement which had been made to them, to the effect that 64 watts of electricity were required to keep a 16 candle power lamp burning, and taking electricity at 5d. per unit, the consumption in three hours would cost a penny. Gas of 24-candle power, such as they had in Dumfries, burned at the rate of 4 cubic feet per hour, gave the same light as the electric lamp, and the cost was only a halfpenny for three hours. This was using gas in an ordinary flat-flame burner. If they used an ordinary Welsbach incandescent burner, the gas consumed would still only cost a halfpenny, but electricity to give the same light would cost 3d., or six times that of the gas. One foot of gas with an ordinary flat-flame burner gave 4-candle power, an ordinary Welsbach burner gave 12 candles, a Kern burner 25 candles, and a Lucas lamp 25 candles. Mr. Currie said he hoped that the ratepayers would give their serious attention to the statement before they recorded their vote for electricity. Mr. Brunton thought it was a serious statement to go out, that gas was just half the price of electricity. If they took a newspaper report on the Carlisle electric light works, they would find that gas there, at 2s. 3d. per 1000 cubic feet, was considered to be only one-third cheaper than electricity, and that corresponded with figures which he himself laid before them last month. Mr. Thomson, in reply, said he did not care what was published in newspapers; he took the figures, and made his own calculation. The Corporation are considering as to the introduction of a supply of electricity, as has been mentioned in the "JOURNAL" more than once; and a statement such as Mr. Thomson has made is useful as a steadying force at a time when the affection

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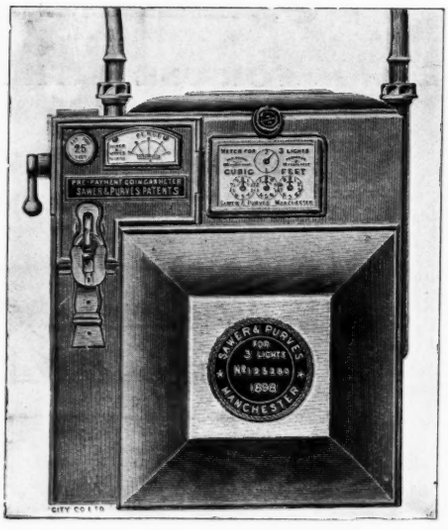

PREPAYMENT METER

FOREMOST EVER SINCE.

SAWER & PURVES

MANCHESTER.

of swelled-head is so prevalent. I cannot understand why it should be objected to; but it will be seen that one member of the Town Council regarded it as a serious matter to let the public know that, light for light, electricity would cost double what gas costs when burned under the least favourable conditions.

Opinions differ, even in Falkirk, as to the necessity for the erection of new gas-works, where I should have thought there was no room for doubting that the necessity is most urgent. Yet so it is. At a meeting of electors, Mr. H. Russell said he was in favour of proceeding with the construction of new works without a week's delay. The works could be erected at a cost of from £40,000 to £50,000, and, instead of their being a burden on the rates, there would be a saving to the ratepayers. The erection of gas-works was not a matter of choice, for by Act of Parliament the Council were compelled to supply every consumer within the lighting area with gas of not less than a certain illuminating power, and at a given pressure. They must comply with the Act of Parliament, they would be under heavy penalties. Therefore the new works must be proceeded with. They had a working man candidate who was in favour of electric lighting for the town all round. He was not arguing against the electric light; but he would point out that the lighting of the town by gas now costs 2½d. in the pound, whereas electricity would cost 11¼d. in the pound—a difference on the rates of 8¾d. At another meeting of electors, Bailie Bogle said he was against the erection of new gas-works. Falkirk was burdened with debt, and it would not do to rush into a scheme for new works. Why should they not buy ground in the vicinity of the present works, and take full advantage of the present site? In this matter Bailie Bogle goes against all expert opinion; and he also forgets the extraordinary efforts which are being made by the staff to keep up a sufficient supply.

The Corporation of Peterhead have this week sanctioned an extensive scheme prepared by the Gas Manager—Mr. G. Keillor, jun.—for the fitting up of the public lamps in the town with new lanterns and incandescent gas-burners. A piece of property adjacent to the gas-works having come into the market, the Gas Committee resolved to purchase it, with a view to the site being used for extension, or the erection of a gasholder, at some future time. The Town Council this week approved of the purchase, the price not to exceed £700.

I observe that at a meeting of the electors of Dunfermline this week, while Dean of Guild Stewart was speaking he referred to the success of the gas undertaking, whereupon a Mr. Brown interrupted with a remark about the gas being bad, to which Mr. Stewart retorted that that was matter of opinion. Continuing, the speaker said he attributed the increase in the consumption during the past three years to the preferential rates offered by the Corporation for gas used for heating, cooking, and motive-power purposes. He prophesied a continuance of the increase when the new carbonizing plant is completed. During the past winter, the plant at the gas-works was incapable of producing the quantity of gas which was needed; and this was the reason of the quality not being all that was required; but that would be remedied soon. Another speaker stated that there were 60 gas-engines at work in the town, and that these and the gas-stoves in use required one sixth of the whole of the gas produced. He therefore thought they ought to encourage the use of gas-engines.

The question as to whether or not a retiring allowance should be granted to Mr. Samuel Stewart, the former Gas Engineer to the Greenock Corporation, has bulked largely at the annual ward meetings of electors. The Provost of the burgh is enthusiastically in favour of granting a pension of £120 per annum. At last Tuesday's meeting of the Gas Committee, a question was brought forward as to a refusal or a grant of this amount; and the former was carried by a bare majority—something like five to four. The Greenock people are altogether opposed to pensions, except in cases where the promise in favour of one has been put in black and white. The Provost's motion will come up at the next Council meeting.

The Town Council of the burgh of Monifieth have found themselves face to face with a new question this week. The Convener of the Lighting Committee reported that he had received a letter from the Gas Company, stating that the meters upon the street-lamps had been out of order, and that they claimed payment of the same sum as the charge for the corresponding quarter of last year. They rendered an account for this amount. One of the councillors thought that, before agreeing to pay the account, they should make sure of their position, as an important principle was involved. The account was accordingly sent to the Lighting Committee to consider the important principle. I suppose the Gas-Works Clauses Act of 1871 is not in force in Monifieth; but it is the authority in such a matter as this, and if its provisions should be followed here, then, according to section 27, the dispute would require to be settled by arbitration. If arbitration be not resorted to, then the arbitrament of the Law Courts is the only resource, and the law is that the register of the meter must be taken as showing the quantity of gas consumed. The important principle is thus reduced to this—that the Council may stand on their right, and not pay more than can be shown to have been consumed; and as the Company have the duty of providing the meters, under the Act, they cannot complain if the Town Council stand upon their rights. At the same time, the proposal of the Company is quite an equitable one, and the Corporation would act fairly if they were to pay the sum charged, even although they should make payment without prejudice to their rights in the matter, which, however, would be superfluous, as whatever they may do will not bind their successors in any way.

Mr. W. M'Crae writes as follows in reference to our correspondent's remarks on the subject of the Dundee appointment contained in the "JOURNAL" for the 7th inst. (p. 959): "Your Scotch Correspondent stated, regarding the Dundee appointment and the salary attached thereto, that 'the late Mr. John M'Crae had a salary of £750 a year.' This is not quite correct, as the largest salary my late brother had in Dundee was £500, with house, coal, and gas. He also alluded to the reconstruction of the retort-bench. This, or rather these, were not rebuilt, as rebuilding was not required; but they were repaired."

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 18.

Sulphate of Ammonia.

The improved demand referred to in the last report has continued, and there has been a slight improvement in values; the closing quotation being £11 12s. 6d. to £11 15s. per ton f.o.b. Hull, and £11 15s. to £11 17s. 6d. per ton f.o.b Leith and Liverpool. Demand has been mainly for the purpose of covering sales for October delivery, and consumers have not been much in evidence, having bought fairly well in advance, and their present ideas being below current prices. No further first-hand forward business is reported, makers being firm at their quotations of £11 15s. per ton, ordinary terms, f.o.b. Leith, and at £11 13s. 9d. London, Beckton terms, October-December, and £11 17s. 6d. January-April delivery. Speculative selling is, however, reported at much below the equivalent of these prices.

Nitrate of Soda.

This is firm, and spot prices have been advanced to 8s. 7½d. and 8s. 10½d. per cwt., for ordinary and refined qualities respectively.

LONDON, *Oct.* 18.

Tar Products.

The markets are firm all round, with the exception of solvent and toluol, which are decidedly neglected. Business has actually been arranged in the latter article at 6½d. per gallon, which is certainly the lowest figure on record. Pitch continues decidedly strong. Business is reported in London at very high prices for immediate shipment, while in the North large contracts have been arranged all over next season, but, of course, at lower prices than those ruling for early delivery. In anthracene, a little more business appears to be doing in "A" quality, 40-45 per cent.; while for the higher percentages there is more inquiry for next year. Business is again reported in 90 per cent. benzol at 8½d. for early shipment; while it is rumoured that an offer of 10d. was declined for delivery all over next year. Makers do not care to contract forward, as there is considerable uncertainty about the production. Carbolic is firmer. A large business has been done for October-December, while there is a considerable inquiry for January-March; but makers prefer waiting rather than accept present prices. Creosote is very firm indeed; and several large transactions have taken place in the North at good prices, while in London there is a strong demand for liquid oil.

The average values during the week were: Tar, 18s. to 24s. 6d. Pitch, London, 54s. to 55s.; east coast, 52s. to 53s.; west coast, 48s. 6d. to 50s. Benzol, 90 per cent., 8½d. to 8¾d.; 50-90 per cent., 7½d. Toluol, 6½d. Crude naphtha, 2¾d.; solvent naphtha, 7d. to 8d.; heavy naphtha, 9d. Creosote, London, 1⅜d.; North, 1¼d. to 1½d. Heavy oils, 2d. Carbolic acid, 60 per cent., 1s. 8½d. to 1s. 9d. Naphthalene, 35s. to 45s.; salts, 21s. to 23s. 6d. Anthracene, "A," 1½d. to 1⅝d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market is steady for prompt delivery, but dull for November-December, although there is a fairly good inquiry for January-March. The Gaslight and Coke Company quote £11 15s. for October, but would accept £11 12s. 6d. to £11 13s. 9d. for November-December; while for January-March their price is £11 17s. 6d. Another large London Company are reported to have accepted £11 12s. 6d. for October shipment, but are now holding for £11 15s. In Hull, business is quiet. £11 15s. has been paid for prompt shipment; but £11 13s. 9d. is the current quotation. In Liverpool, there is a fairly good demand at £11 15s. As regards Leith, there is not much doing. Sales were made last week at £11 13s. 9d., but buyers will not now pay more than £11 12s. 6d. for October shipment.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The only strong feature of the market here is the house-fire coal trade, the quite unnecessary rush of buying, brought about by sensational reports in the daily Press, having resulted in a general advance throughout Lancashire of 10d. to 1s. per ton. In all probability, this advance, which simply brings prices back to the rates ruling last winter, would have come about in the ordinary course with the close of the present month; but the scare on the part of consumers has forced on the advance earlier than was originally intended. Pits have been so pressed with orders that many of them have run largely into arrear with deliveries. The apprehension now is that, seeing prices are not being rushed up as the exaggerated newspaper reports have represented, and the advance having been settled, there will be a lull for the time being in the weight of further orders coming forward. Prices at the pit now average about 15s. to 15s. 6d. per ton for best Wigan Arley, 13s. and 13s. 6d. to 14s., according to quality, for Pemberton four feet and seconds Arley, and 10s. 6d. to 11s for common house coal. The position with regard to other descriptions of fuel remains weak if anything. The settlement of the coal disputes, not only in America, but on the Continent, is causing a cessation of any extra buying for export. Inland demand for steam, forge, and general manufacturing purposes continues but very indifferent. The result is that common round coals are fairly plentiful, and prices are barely maintained at late rates. For inland sales, quoted prices still average 8s. 6d. to 9s. per ton at the pit; but under these figures is taken in some instances. For shipment, where 12s. per ton was being got a week or so back, the average figures are not now more than 10s. to 10s. 6d. for steam coal, delivered at the Mersey ports. In the medium and lower qualities of slack, although competition from outside districts is perhaps not quite so keen as recently, there is still a considerable surplus on the market offering for clear-

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ance at low-cut prices. At the Lancashire collieries, common slack ranges from 4s. 6d. to 5s. at the pit, and medium 5s. 6d. to 6s.

Northern Coal Trade.

The influence of the demand for coal for the United States and for France has been felt, and the price has been irregularly higher. For steam coals this has been most markedly shown, and the price rose at one time to fully 4s. per ton above that which prevailed up to some three weeks ago. At present, best Northumbrian steams are about 12s. 9d. per ton f.o.b., second-class from 11s. 6d. to 12s. 6d., and steam smalls 6s. 6d. to 7s. In the gas coal trade, the demand is now increasing more rapidly, and heavy shipments are being made to the great consuming companies. The quotations that are generally made for Durham gas coals vary from 9s. 6d. to 10s. 9d. per ton f.o.b., according to quality, for cargoes. One or two small contracts have been entered into for gas coals for export next year; and the price is believed to be from 9s. 3d. to 9s. 6d. per ton f.o.b., or about the same figures that ruled in the previous similar contracts. There is no variation this week in the price of gas coke; but the production is now a little heavier, and is increasing.

Scotch Coal Trade.

Though it is generally accepted that a considerable quantity of Scotch coal has been required to take the place of coal which has either been sent to America, or which might have been supplied from America, it cannot be said that the supply has been affected. The demand has quickened, in anticipation of scarcity, and this has reflected on the price; but there never has been any difficulty in getting whatever quantities might be wanted. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 6d. to 11s. 6d., and splint 10s. 6d. to 11s. The shipments for the week amounted to 257,320 tons—an increase of 16,071 tons upon the preceding week, and of 61,682 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,463,781 tons—an increase of 719,760 tons upon the same period of the previous year.

Bath Water Supply.—The Bath Water Committee have decided to recommend the carrying out of a portion of what is known as the Ayford scheme for increasing the water supply of the city. This scheme, in its entirety, provided for a new reservoir, the purchase of further springs, and a new service-main. The modified plan will omit the reservoir, and provide for the springs to be acquired being collected in a small receiving tank. The cost is £45,000, as against £90,000 the estimated outlay required for the full scheme. The construction of the reservoir could be undertaken later, if considered necessary. As the smaller proposal will still require an Act of Parliament, there is certain to be a poll of the city, should the recommendation be adopted by the Town Council.

Manchester Water Supply Safe.—The recent rains have so far improved the position of affairs at the Manchester Corporation Water-Works in the Longdendale Valley that all anxiety for the remainder of this year is now at an end. The stock of water in the reservoirs on Thursday last amounted to 2963 million gallons, which is equivalent to 78 days' supply.

Honiton Water Supply.—The long dispute over the question of the water supply of Honiton appears likely to come to an end. Last Thursday, the Town Council decided to seal a contract for the construction of a reservoir at St. Cyres, the cost of which is to be £5199. The opponents of the scheme protested to the last, and contended that the expense would ruin the town.

Proposed Gas-Works Purchase at Bridport.—The Bridport Town Council have passed a resolution that the question of the advisability of purchasing the undertaking of the local Gas Company be referred to the Valuing Committee to consider and report upon. The subject first came before the Council in the shape of a motion by Mr. Spiller that the Gas Company should be approached so as to ascertain their views with regard to the town taking over the works; but this was subsequently withdrawn in favour of a suggestion to refer the matter to the Committee.

Accident at the Walton-on-Thames Gas-Works.—On Monday of last week, when a number of iron pipes weighing about 15 cwt. each were being unloaded from a trolley at the Walton-on-Thames Gas-Works, the plank down which they were being rolled to the ground suddenly broke. Unfortunately, the pipe which was at the time being lowered fell on one of the Company's employees named Lee, whose left thigh was fractured and the leg also broken in two places. The injured man was promptly conveyed to St. Thomas's Hospital, where it was found necessary to amputate the limb.

Sales of Shares.—Last Tuesday, Mr. Charles A. Joel sold by auction £60,000 of ordinary stock of the Newcastle and Gateshead Water Company, bearing a maximum dividend of 7 per cent. Forty-five lots of £100 were purchased at £153 each, 66 at £152 10s., 109 at £152, 15 at £151 10s., 101 at £151, 196 at £150 10s., 63 at £150, and 5 at £150 5s. The total proceeds of the sale amounted to £90,740 15s., or an average of about £151 4s. 8d. per £100 of stock. Mr. C. F. Moore recently sold 130 new ordinary 7 per cent. shares of £15 each in the Cirencester Gas Company at prices ranging from £21 15s. to £22 each. On Thursday last, Messrs. Sadler and Boker offered for sale by auction 800 7 cent. cumulative shares of £10 each in the Frimley and Farnborough District Water Company. The total amount realized was £11,131 5s., or an average of about £13 18s. 4d. per share. In accordance with the announcement which appeared in our advertisement columns, Messrs. Alexander Daniel and Co., of Bristol, sold by auction last Thursday £15,000 of 7 per cent. maximum consolidated ordinary stock of the Bristol Water Company. It was offered in lots of £100 and upwards; and the highest price realized was £153 15s., and the lowest £152—the average being £152 8s. 4·4d. per £100 of stock. The total amount realized by the sale was £22,862 15s.

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Swansea Gas Company.—At the recent meeting of the Swansea Gas Company, the usual dividends were declared. After the meeting, the shareholders visited the new works, which include, among other things, a retort-house.

Gas Supply to Heaton and Frizinghall.—The Bradford City Council have agreed that the offer of the Shipley District Council to sell the portion of their undertaking which lies within the city for the sum of £31,000 shall be accepted; and the Town Clerk has been instructed to take all necessary steps for completing the purchase and obtaining the requisite powers. From Jan. 1 next the consumers of gas in Heaton and Frizinghall will pay 2s. 3d. per 1000 cubic feet, as compared with 3s. 4d. which they have paid for the past twenty years.

Hampton Court Gas Company and their Rates.—The Collector to the East Molesey District Council has issued a summons against the Hampton Court Gas Company for non-payment of rates. The Company gave notice of appeal about two years back against an increase in their assessment from £420 to £861. A few weeks ago the appeal was heard, and the assessment was reduced to £421. The Company claimed that the Council should refund to them the amount of rates which they have paid since their notice of appeal, over and above the rates based upon the reduced assessment. The amount involved is over £200.

Gas Undertakings in the Colonies.—In addition to the particulars already given of the progress of gas undertakings in the colonies, others have lately come to hand which show that the Maryborough (Queensland) Gas Company had a net sum of £1014 for disposal as the result of the working in the six months ending the 30th of June last. The payment of a dividend at the rate of 6 per cent. per annum took £771 of this, and left £243 to be carried forward. The North Shore (Sydney) Gas Company made a net profit of £3742 in the above named period, which was brought up to £3831 by the addition of the amount carried forward. The Directors recommended a dividend of 3½ per cent. for the half year, which absorbed £3790, and left a balance of £41 to go forward.

The Removal of Coronation Illuminations.—The whole of the fittings in connection with the Coronation illumination of the Council House, Town Hall, and Art Gallery at Birmingham have now been removed, and during the entire course of erection and removal not a single mishap has befallen the workmen engaged. The method adopted was for each man to work with a girdle around his waist, fastened to a rope which was secured to the ladder wherever he was working. Rubber shoes were also served out in order that the workmen might secure a firm foothold. On one occasion, the necessity for these precautions was clearly illustrated. A vehicle happened to strike the base of one of the fire-escapes on which two men were engaged; and the force of the collision flung both of them from their places. But for the ropes attached to them, a shocking accident would have occurred. As it was, they swung back safely on to the ladder again.

Ilkeston and Heanor Water Board.—Last Wednesday week the foundation stone was laid of the water-works to be constructed by the Ilkeston and Heanor Water Board at the Meerbrook Sough, Whatstandwell. The contracts amount to £108,209, which is well within the parliamentary estimate; and the works have been designed to supply a million gallons of water a day. It is anticipated that the scheme will supply the needs of the district for at least a generation, and that the supply will be available within twelve months.

Wide Tendering.—A few weeks ago, reference was made in the "JOURNAL" to the great difference in the amount of the various tenders received for sinking a well and driving some adits in connection with the new water supply scheme for Margate. The Wingham Agricultural Implement Company's tender was accepted—the figure being £9449; while the highest offer received was £37,546. It is now stated that the Company have withdrawn their tender; and the Town Council have therefore decided to carry out the work themselves.

Richmond (Yorks.) Gas and Water Supply.—At a meeting of the Richmond (Yorks.) Borough Council last Thursday, the receipts from the gas undertaking were reported to be £3176, and the payments £2846; leaving a surplus of £330. It was decided to place £100 to the borough fund, and reduce the price of gas to 4s. per 1000 cubic feet, subject to a discount of 10 per cent. for lighting purposes and 20 per cent. for cooking and heating, if paid within one month from the date of the account being sent in. The water receipts were £613, and the expenditure was £260; leaving a surplus of £353.

Unpleasant News for Devonport.—The Devonport Corporation received recently the unwelcome intelligence that the Admiralty are preparing a comprehensive scheme for supplying electric light and power from a station to be erected in the Dockyard. If this intention should be carried out, it will have a serious effect upon one of the municipal undertakings. The Admiralty and the War Office between them take about 25 per cent. of the gas produced; and though the Government insist upon being supplied at a lower rate than ordinary consumers, they are a very important customer of the Corporation. A good many hints have been dropped of late years as to the possibility of electricity being adopted in the Dockyard; and it has no doubt been hoped that if this should be done current would be purchased from the Corporation whose electrical works are now in operation. Perhaps this hope is not entirely abandoned. The Mayor (Mr. Leest) was asked at the last Council meeting if the Admiralty had definitely decided to supply their own electricity; and he replied that they were only considering a scheme. The official intimation appears to go a little further than this; but apparently the Corporation have nothing to do but await developments. Although it will be a serious matter, the loss of the Dockyard custom will perhaps not have so grave an effect on the gas undertaking as it would have had a few years ago. Devonport has grown very much of late, and there is a new district awaiting to be supplied with gas so soon as the mains can be carried to it. The Corporation would, however, have preferred to add the new customers to the old, rather than take them on merely to fill a gap.

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